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Has Tin Plate a New Competitor?

BY DR. C. L. MANTELL*

ALUMINUM producers, particularly on the European Continent, are actively looking for new markets and possible uses for their metal. Recent development work has been along the lines of substitution, for tin plate used in the canning industries, of aluminum as aluminum-coated steel plates.

About 40 per cent of the world's production of tin goes into tin plate, and of this from 60 to 75 per cent is used for food containers or tin cans. In the United States efforts have been made to reduce the amount of tin used in plating, and at present this is about 34.94 lb. per ton of tin plate, against 38.83 lb. used in 1922. In England and on the Continent, the quantity of tin used per ton of tin plate is somewhat more than 34.94 lb.

The employment of aluminum plate as a substitute for tin plate was the subject of research in Germany during the war, but no success was obtained, due to the fact that the quality of the aluminum of that time was much inferior to that of the virgin aluminum manufactured today. It was discovered that aluminum, to replace tin plate for food containers, must possess particularly high mechanical and chemical properties.

The Aluminum Advisory Bureau in Berlin caused this question to be further investigated. The influence of aluminum of 99 to 99.5 per cent purity on preserved food of different kinds, and the influence of these foods on the aluminum, were tested, with the result that drawn aluminum plate of the above degree of purity was found to be well suited for food containers and, compared with tinned plate, was very slightly attacked by the foodstuffs. Vegetables, fruit, and other materials were not found to depreciate in aluminum containers.

Germans Planning to Erect Plants

In recent months, at periodic intervals, reports have been circulated of German plans to make aluminum-coated sheets to compete with, and perhaps eventually replace, tin plate. The Aluminum Research Institute in Germany has devoted some attention to the application of aluminum sheets according to the patents of a German engineer by the name of Serger. These reports have aroused considerable interest among tin plate manufacturers.

The Eisen & Stahlwerk Hoesch at Dortmund has completed a program of development toward working out the kinks in rolling aluminum on steel. Krupps and Stockheide are reported to be building a large sheet rolling mill in

Aluminum-Coated Sheets Advocated in Germany, But Some Question of Their Early Achieving Popularity—How the Aluminum Is Put On

which aluminum-plated steel sheets will be turned out at the rate of about 100,000 tons annually. It is interesting to note that the Eisen & Stahlwerk Hoesch is reputed to be building a works for the production of these Feran Bleche with a capacity of 30 tons per hour, which would be an annual production of 220,000 tons. This is twice as much as the

whole of the German tin sheet production.

The aluminum and the steel sheets are sweated together. In commercial operation, aluminum-coated hoop steel has been a commercial article for a considerable time. It is claimed that these aluminum-coated sheets are 11 per cent lighter than tin sheets, and that they have better corrosion resistance. The latter part of this statement must be taken with a large grain of salt, in view of the extensive and satisfactory application of tin plate in its multiplicity of uses, and the well-known tarnishing of aluminum with the formation of a protective oxide coating as a result of atmospheric conditions.

Aluminum-Coated Sheets Light

Considered on a theoretical basis, assuming tin plate to contain approximately 1.6 to 1.8 lb. of tin per base box, and in view of the fact that aluminum is a much lighter metal than tin, the same weight coating of aluminum should allow a coating three times as thick. With tin at approximately 48c. and aluminum at 24c., the coating on a metal basis only should cost but half as much.

Any reasoning from this basis is fallacious and conclusions illusory. The cost of tin in place of tin plate is very little more than the metal cost, inasmuch as the tin needs undergo no fabrication. The same, however, does not hold true for aluminum in its application on steel sheets, for the coating must bear the fabrication cost of putting the aluminum metal into such shape that it can be sweated on, or rolled with, steel plate. There is practically no manufacturing data as yet of an authoritative nature which will allow a comparison of costs between aluminum-coated sheet and tin plate.

Technology of the Coating Process

Sheet steel, coated with aluminum by a mechanical sweating or welding method, has been produced previously. The aluminum layer is always relatively thick. Material of this kind has shown high resistance to accelerated corrosion tests. It is to be noted, however, that aluminum and iron alloy rapidly. It would seem then that the fundamental conditions for successful coating by hot dipping were ful-

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filled. Iron and aluminum are completely miscible in the liquid state. In the aluminum rich mixtures, the iron precipitates from the solution upon solidification as the compound FeAl_3 , containing 41 per cent iron. This compound forms only very slightly below the melting point of aluminum.

Success in hot dipping of iron and aluminum is attained with difficulty and only after special preparation of the surface of the iron. Much of the difficulty is to be attributed to the tightly adhering film of aluminum oxide, which forms very rapidly, as well as to the occurrence of a large amount of iron-aluminum compounds. When iron is coated with aluminum, either by hot dipping or by mechanical rolling methods, there is a rapid alloying action occurring between the two metals. This usually results in a very brittle layer adjacent to the steel or iron base. The uses to which such material could be put would be limited to those which did not involve bending or any other form of severe deformation.

From the relative positions of aluminum and iron in the electrochemical series, it might be concluded that aluminum would be a more desirable coating metal for the protection of iron and steel than tin, inasmuch as aluminum would be anodic in its reaction to iron. The behavior of coatings in service, however, does not fully support such a conclusion. The protective oxide film, which readily forms on a fresh surface of aluminum on exposure to the atmosphere, entirely masks the anodic behavior of an aluminum coating toward iron. The coating then becomes essentially neutral in its electrochemical reaction toward iron.

Tin and Aluminum Coatings Compared

In a number of its applications, tin plate is used for decorative purposes, and the tin coating on iron markedly improves its external appearance. It is very doubtful whether aluminum-coated sheets can be made in the near future on a commercial basis so that they will have the pleasing appearance of silvery white tin plate. The tech-

nology of tin plate manufacture is exceedingly well developed. In contrast, the manufacture of aluminum-coated sheets has practically no technology.

In one of its major applications, that of tin cans, tin plate has been found to be an all-round satisfactory container for almost all foods. Modifications, such as enameled plate, have been developed to adapt the material specifically to the preservation of certain foods in the best possible manner. The toxicology of tin and tin salts has been widely studied. Cases of tin poisoning are almost unknown. In contrast, there is considerable dispute as to the toxicology of aluminum and its salts.

It is yet to be shown on a commercial basis that aluminum-coated sheets can be produced so that the coating of the aluminum on the iron is free from pinholes and perforations, or at least equal to the quality, as far as uniformity of covering is concerned, of good grade tin plate.

Little Cause for Worry for Tin Plate Makers

At the present moment there is very little cause for worry on the part of the tin plate maker in reference to this development. Tin plate and tin cans are exceedingly well established. Aluminum-coated sheets may become important in the future, but at the present time the application is still largely in its development stages.

Many substitutes for tin plate have been tried out, but in practically every case it has been proved beyond question that the tin can makes the best hermetically sealed package for the preservation of all kinds of food. True enough, in a number of cases the tin can has been modified to make it more satisfactory for certain foods, and even now it is unsatisfactory for foods like cider, cranberries, apple butter, apples, rhubarb, and some berries.

As the country develops and the population grows, the demand for tin plate would be expected to increase. Such has been the case, and the manufacturers of tin plate see a boom nearly every year on account of the very large and growing demand.

Chrome-Tungsten Steel Excellent at High Temperatures

CONTINUING their work on boiler materials, Prof. A. E. White and C. L. Clark, Department of Engineering Research, University of Michigan, now report on the "Effect of Alloying Elements upon the Stability of Steel at Elevated Temperatures." A standardized short time tensile test was used to enable them to explore a number of promising alloys at 1000 deg. Fahr. and above. Confirmatory long-time creep tests were made on those giving best results in the preliminary investigation.

From the large mass of data secured, the authors se-

Table I—Annealed High-Alloy Steels Tested at 1000 Deg. Fahr.

Composition	Proportional Limit, Lb. per Sq. In.	Ultimate Strength, Lb. per Sq. In.	Elongation in 2 In., Per Cent	Reduction in Area, Per Cent
0.15 C, 19 Cr, 8.5 Ni...	9,500	55,650	32.5	64.8
0.3 C, 8 Cr, 20.6 Ni...	11,500	62,350	30.2	56.4
0.5 C, 9 Cr, 3.5 Ni...	15,190	68,850	26.8	69.9
0.4 C, 8 Cr, 8 W.....	17,500	60,475	24.0	68.2

lected the proportional limit at 1000 deg. Fahr. as the best index of merit. On this basis a 2 per cent and a 5 per cent nickel steel gave little better figures than a plain carbon steel. Low-manganese steels have already been shown to be superior to either carbon or low-nickel steels, although the present investigators are unable to secure proportional limits at 1000 deg. Fahr. within 20,000 lb. per sq. in. of those reported by Krivobok and his associates to the Mining Engineers in 1927. Low chrome-nickel steels are classed in the same category as the low-manganese steel as far as proportional limit at 1000 deg. Fahr. is concerned; they

are, however, much more expensive. On this same basis, several high-alloy steels in the annealed condition showed good but not unusual properties. (See Table I.)

The last mentioned steel seemed to show such marked superiority that tensile tests were made at 1000 deg. Fahr. after various heat treatments. A proportional limit of 100,000 lb. per sq. in. was secured with little ductility, but other treatments gave 50,000 lb. with elongations of 17 per cent. (See Table II.)

Such a steel is not easy to machine or otherwise fabricate, but Messrs. White and Clark believe it to be very

Table II—Heat Treated Chrome-Tungsten Steel Tested at 1000 Deg. Fahr.

Heat Treatment	Proportional Limit	Ultimate Strength	Elongation in 2 In.	Reduction in Area
Annealed 1700 deg.....	17,500	60,475	24.0	68.2
Normalized 1800 deg....	50,000	More than 140,000	Not broken	
Normalized 1800, Drawn 1200	32,500	119,000	17.5	51.7
Normalized 1700, Drawn 1200	45,000	118,000	17.0	57.0
Quenched 1700, Drawn 1200	52,500	119,150	14.5	52.8
Quenched 2250, Drawn 1200	100,000	125,000	2.0	3.9

promising for high-temperature, high-pressure work. A sample normalized at 1700 deg. Fahr. was loaded at 35,000 lb. per sq. in. while heated constantly at 1000 deg. Fahr. The extension gradually increased to about 0.0023 in. per

(Concluded on page 1616)

Grain Size Controls Toughness

McQuaid-Ehn Test Necessary to Distinguish Between Heats of Steel
with Same Chemical Analysis Yet Responding
Differently in Mass Production

BY THOMAS W. HARDY*

IN the thirty years which have elapsed since Kjellin, Stassano and Heroult gave the steel maker the electric melting furnaces, the electrical engineer has come to realize that electrical considerations must be subordinated to metallurgical, and the metallurgist has learned that the process is not a simple cure-all. With the elimination of the early misconceptions, the art and practice of steel making has had a phenomenal development and electric steels are finding wider and wider application.

Still there are limitations. As long as pig iron is converted into steel, it is doubtful if the electric furnace can ever displace the Bessemer converter and the open-hearth furnace for common steels, since the first mentioned is neither an efficient nor an economical apparatus in which to carry out the strongly oxidizing reactions necessary.

Yet for producing light and medium weight castings, the acid electric furnace has displaced the crucible and is making inroads on the small Bessemer converter. The chief reason is economic; but it is also true the product is sounder, more uniform and generally of higher quality than converter castings.

For tool steels the story is much the same. In the United States almost entirely, and in Europe to a large extent, the old crucible process has been supplanted by the basic electric process; the steel is equal in quality to the best crucible steel and the cost is considerably less.

It is in the production of engineering steels that electricity seems destined to play the dominant part. Engineering steels include simple and alloy steels for automobiles, aircraft, locomotives and similar machines requiring high quality and reliability. Rapid expansion for such purposes may be ascribed to two main causes; first, higher specialization by the automotive and other industries; and, second, a smaller price differential between open-hearth and electric steels from large tonnage, high-powered furnaces. Perhaps it would be better to state that the large tonnage, high-powered electric furnace has been developed to meet the demand for a reasonably priced high-grade steel made

to closer chemical limits and more uniform physical characteristics.

Close Chemical Control in the Basic Electric Process

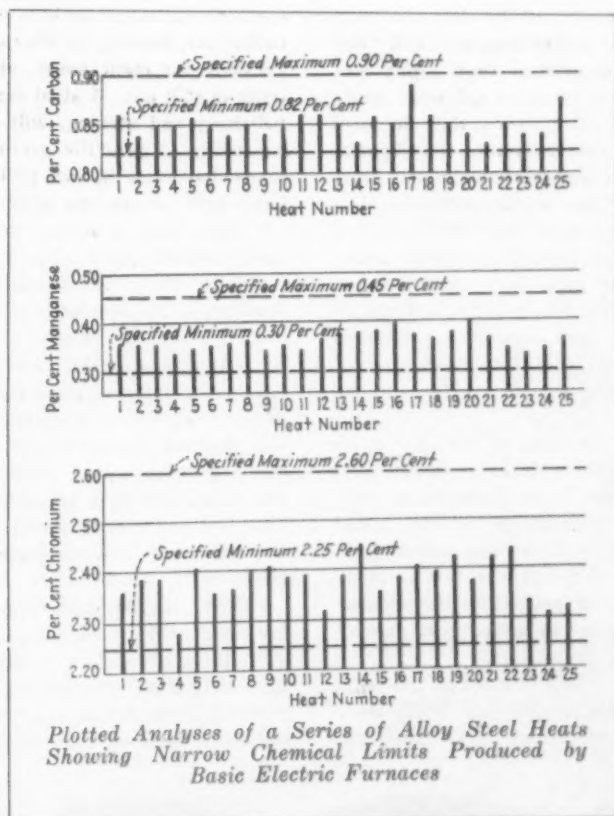
Until recent years the necessity for close chemical control was not urgent. The steels in common use were made to specifications permitting a carbon range of 10 points and correspondingly wide ranges for other elements. Furthermore, the Society of Automotive Engineers' specifications were so framed that, should the melter miss the carbon range he was aiming at, the heat would still be within some other specification and would therefore be marketable.

Recently, large customers have begun to specify 5-point carbon ranges, and also to narrow and change the conventional ranges of alloying elements to suit their own ideas. In addition, special purpose steels are bought sometimes containing three or more alloying elements to close limits, compositions that are so different from any S.A.E. alloy as to make them unsaleable should the heats be "off" chemically. Close chemical control has thus become an absolute necessity.

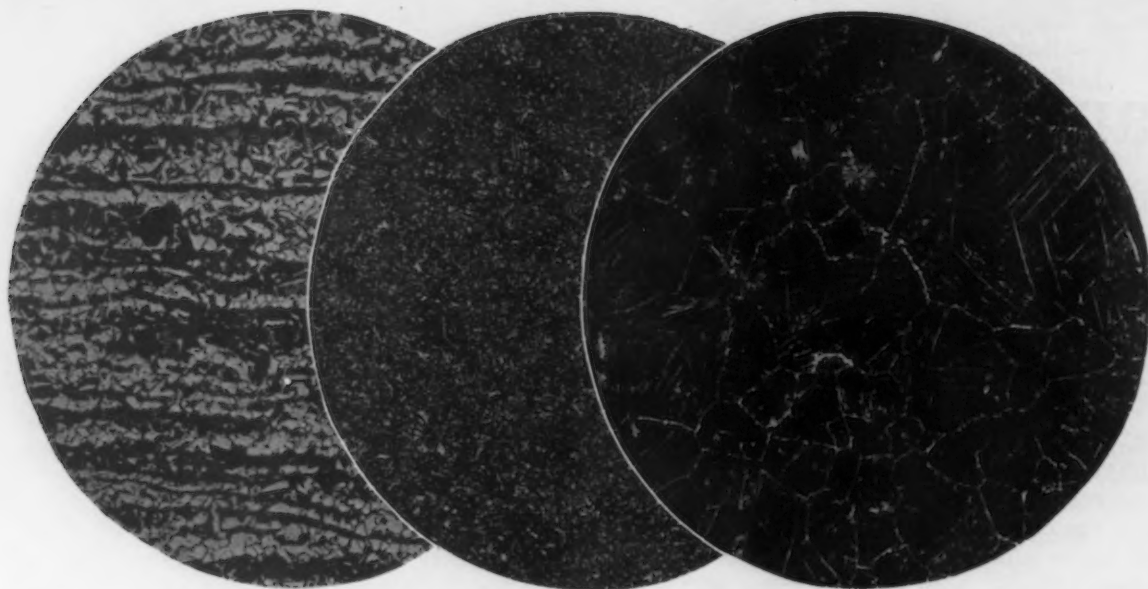
Fortunately the basic electric process permits such close control. The reasons are fundamental. With the older processes, the molten metal is in contact with a more or less oxidizing slag which is constantly removing oxidizable constituents such as carbon, manganese and chromium. In the basic electric process, however, the slag is not merely non-oxidizing, but is actually reducing in character, so that oxidizable elements may be held in the bath without loss until the chemical laboratory has made an exact analysis. Additions may then be made on a mathematical basis and the chemical composition of the finished steel controlled with exactitude.

As an illustration see the accompanying graph of the composition of a series of high-chromium heats. These were made consecutively in three different furnaces by routine methods and the graphs include every heat made during that particular campaign.

But a specified chemical composition does not insure definite physical characteristics. It is well known that



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*Low-Manganese Steel 26 MC at 100 Diameters. Left to right:
As rolled
Heat treated to 269 Brinell
McQuaid-Ehn test*

heats of steel of practically the same analysis do not always respond similarly to forging and machining, nor will they always develop the mechanical properties that might reasonably be expected. Such conditions have led some users to specify, in addition to chemical composition, that the steel must be capable of developing certain minimum physical properties when subjected to certain mechanical and thermal treatments. The reason for this double requirement is that special treatment has to be devised for "off" heats; in many instances heats are returned to the maker as hopeless. Automatic machine tools and continuous annealing and heat treating equipment are not flexible enough to admit of more than minor adjustment to take care of variables in machining quality and response to heat treatment, even if it were known just what changes would produce the desired results.

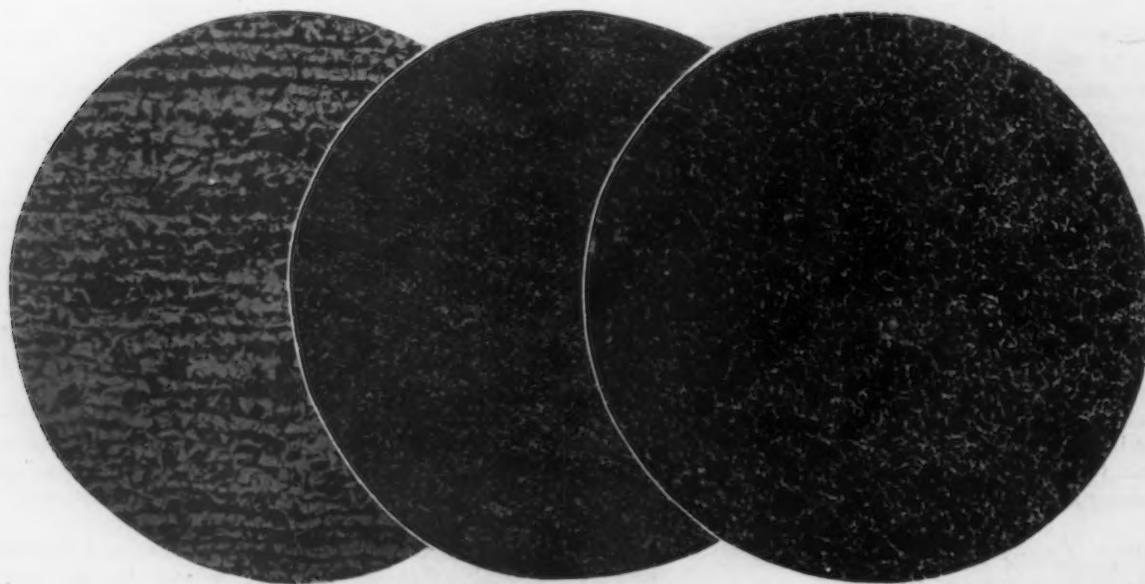
Probable the most valuable outcome of the McQuaid-Ehn test is the attention it has drawn to the physical characteristics of steel as distinguished from its chemical composition. Originally devised to distinguish between heats of steel that would respond normally to routine case hardening operations and heats that would not, the test is probably more often used as a means of predicting the manner in which a heat of steel will respond to subsequent annealing, machining and heat treating operations.

It is well known that different heats of steel of the same chemical analysis will develop widely differing grain sizes when carburized under standard conditions. The latter op-

eration consists of packing the sample in a highly energized carburizer, heating to 1700 deg. Fahr., holding at this temperature for eight hours, and cooling the pot and its contents in still air. A steel sample thus treated, after suitable polishing and etching, will exhibit in the case a structure consisting of pearlitic grains, the boundaries of which are made sharp and distinct by the network of excess cementite. Grain-size charts are used, showing photomicrographs at 100 diameters of steels that have developed different but fairly definite grain sizes in this carburizing test, and the unknown sample is classified as, say a No. 5 or a No. 8, according to its similarity to one or other of the photomicrographs on this chart.

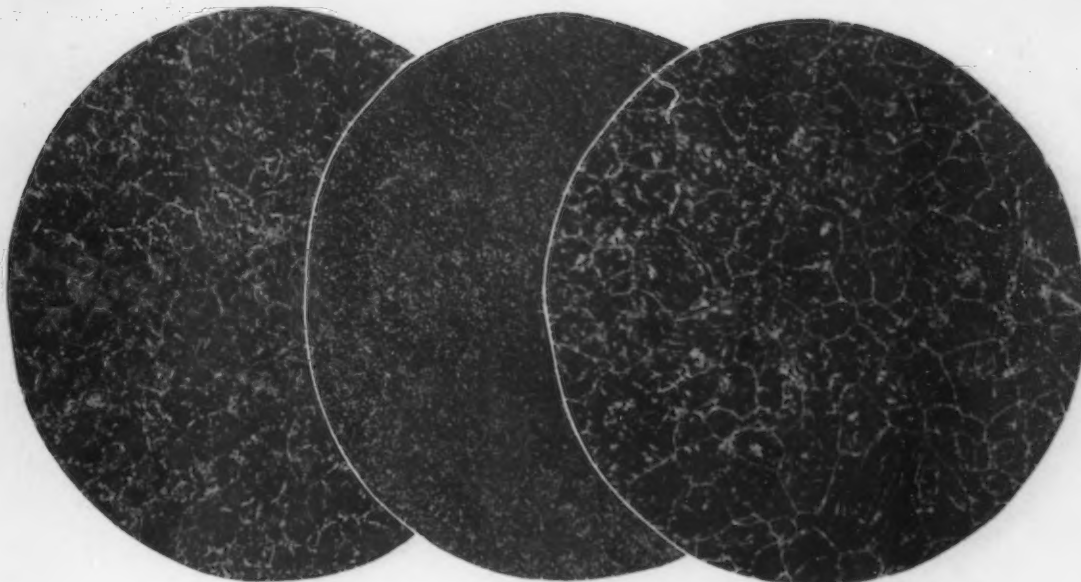
This McQuaid-Ehn carburizing test is being applied not only to carburizing steel but also to medium and high carbon, simple, and alloy steels, and experience has shown that the physical characteristics are considerably different in a steel that develops a coarse grain in the carburizing test and in a chemically similar one that develops a fine grain. This difference is so great that it sometimes accounts for the difference between success and failure in mass production.

Three of the most important physical characteristics are hardenability, machinability and mechanical properties. That these are definitely influenced by the same conditions that determine whether the steel will be coarse or fine grained in the carburizing test will be seen from the following data, selected from a large number available, not be-



Steel 26 MF. Similar in chemical composition to 26 MC above but responding differently to carburizing test

Low-Manganese Steel 40 MC at 100 Diameters. Left to right: As rolled Heat treated to 269 Brinell McQuaid-Ehn test



cause they show the extreme variables, but because they are the results of tests made under strictly comparable conditions.

Hardening Power of Fine Grained Versus Coarse Grained Steels

Many observations have led to the generalization that, other things being equal, steels that are coarse grained in the McQuaid-Ehn test harden more intensely and deeper than those that are fine grained. This difference in hardness is most pronounced in plain carbon and low alloy steels and becomes negligible in the higher alloys. The following data on 1-in. rounds illustrate these points:

In order to treat the fine grained steel and its companion coarse grained steel to the same Brinell hardness at the center of the bar, a considerably lower drawing temperature had to be used for the fine grained steel, because it has lower hardness after quenching.

Here it will be noted that the deep hardening action caused by molybdenum has been sufficient to overcome the effect of grain size on the hardenability of steel and the two steels respond exactly the same to a given heat treatment as far as Brinell hardness is concerned.

Machinability

The writer regrets that he is unable to present concrete figures to illustrate the superior machining quality of coarse grained steel. That this superiority exists cannot be doubted

in the face of actual production results independently obtained by several large users who worked steels of known grain size.

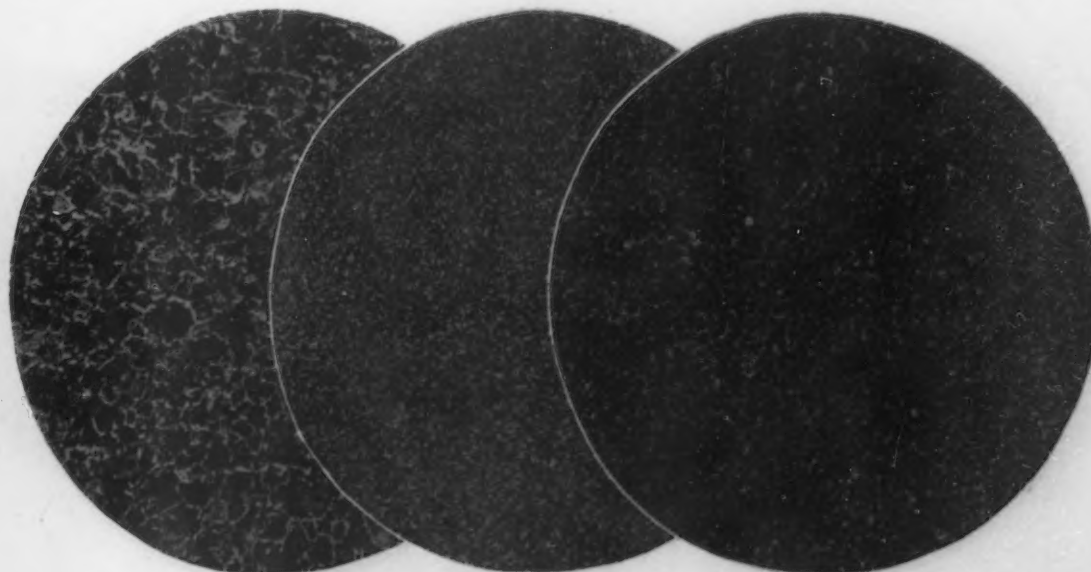
Mechanical Properties of Fine Grained Steels

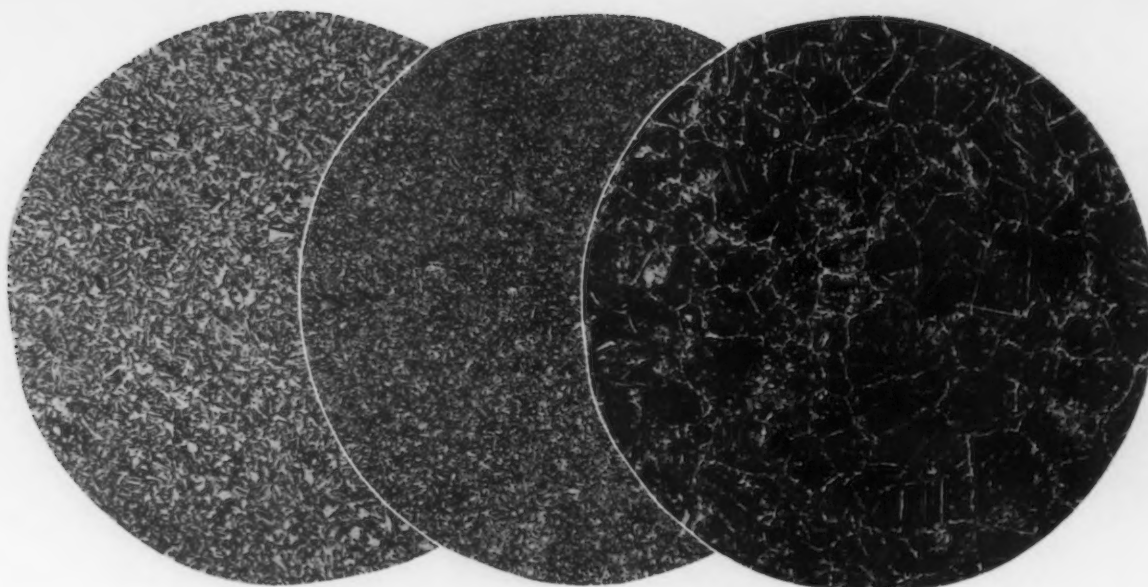
Ready machinability, important though it may be to the man interested in rapid and economic production, is not the

Low-Manganese Steels				
Heat No.	26 MC	26 MF	40 MC	40 MF
Carbon	0.26	0.26	0.40	0.39
Manganese	1.58	1.46	1.71	1.69
Phosphorus	0.018	0.017	0.019	0.016
Sulphur	0.017	0.018	0.018	0.018
Quenching temperature..	1525 deg. Fahr.	1525 deg. Fahr.	1500 deg. Fahr.	1500 deg. Fahr.
Medium	Water	Water	Water	Water
Drawing temperature ...	900 deg. Fahr.	800 deg. Fahr.	1000 deg. Fahr.	850 deg. Fahr.
Grain size	No. 6 (coarse) Fig. 1	No. 10 (fine) Fig. 2	No. 6 (coarse) Fig. 3	No. 10 (fine) Fig. 4
Brinell hardness:				
Surface as quenched...	534	514	555	534
Center as quenched...	534	477	555	495
Surface after drawing..	269	311	321	341
Center after drawing..	269	269	321	321

main concern of the designing engineers. To them the group of attributes generally called "mechanical properties" are of fundamental importance, since upon these values the design is based.

Steel 40 MF. Similar in chemical composition to 40 MC above but responding differently to carburizing test





*Manganese-Molybdenum Steel 26 MMC at 100 Diameters. Left to right:
As rolled
Heat treated to 269 Brinell
McQuaid-Ehn test*

The results of a large number of tests on various types of steel show clearly that while the tensile properties of a given steel are practically independent of the grain size after the carburizing test, the dynamic strength as measured by the Izod impact test is decidedly greater in fine grained than in coarse grained steels.

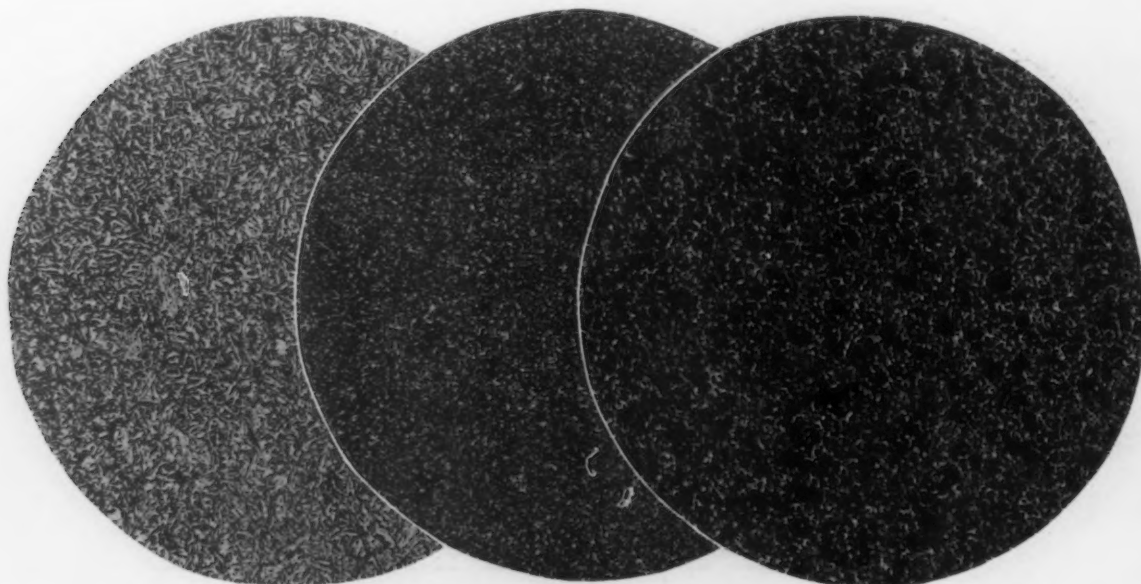
To illustrate this characteristic difference in the steels already described when heat treated to the same Brinell hardness, the appended test results are submitted. Each pair of steels was made and tested under comparative conditions and the figures presented show general tendencies that have been confirmed with other types of steel. The fig-

ures given are the average of four tensile tests and 12 impact breaks from each heat.

A consideration of these data leads to several conclusions the more important of which may be summarized as follows:

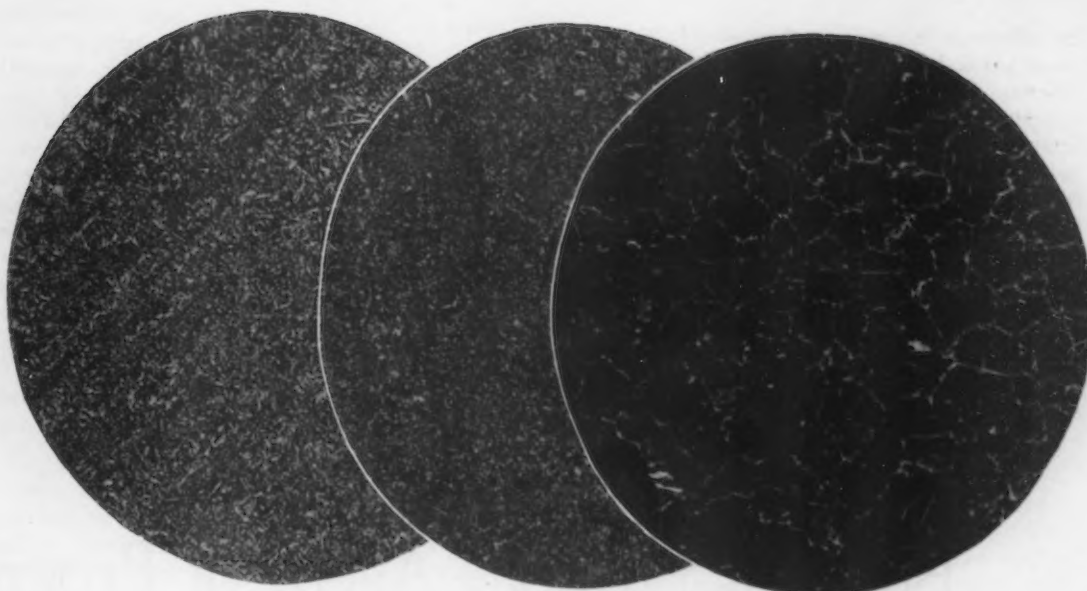
1. Other things being equal, the resistance to shock, as measured by the Izod impact value of a steel that is fine grained in the carburizing test, is distinctly greater than that of a steel that is coarse grained.
2. This greater toughness of fine grained steels is also reflected to some extent in the figures for reduction in area.
3. The values for yield point, ultimate strength and elongation appear to be unaffected by the grain size in the carburizing test.
4. Other things being equal, the addition of molybdenum to a straight manganese steel, be it coarse grained or fine grained, results in greater impact strength.
5. The importance of grain size to the impact resistance of steel is clearly brought out by the fact that the fine grained manganese steels of both carbon contents developed approximately the same Izod values as the coarse grained manganese-molybdenum steels, indicating that as regards Izod value, the existence of a fine grain in the carburizing test is as important as the presence of 20 to 25 points of molybdenum. The combination of molybdenum and fine grain is, of course, still more desirable.

<i>Manganese-Molybdenum Steels</i>				
Heat No.	26 MMC	26 MMF	40 MMC	40 MMF
Carbon	0.25	0.28	0.39	0.39
Manganese	1.47	1.59	1.74	1.77
Molybdenum	0.24	0.27	0.26	0.24
Phosphorus	0.016	0.016	0.017	0.018
Sulphur	0.018	0.017	0.017	0.016
Quenching temperature...	1525 deg.	1525 deg.	1500 deg.	1500 deg.
Medium	Fahr.	Fahr.	Fahr.	Fahr.
Drawing temperature...	1100 deg.	1100 deg.	1030 deg.	1030 deg.
Grain size	No. 6 (coarse) Fig. 5	No. 10 (fine) Fig. 6	No. 6 (coarse) Fig. 7	No. 10 (fine) Fig. 8
Brinell hardness:				
Surface as quenched...	534	534	555	555
Center as quenched...	534	534	555	555
Surface after drawing...	269	269	321	321
Center after drawing...	269	269	321	321



Steel 26 MMF. Similar in chemical composition to 26 MMC above but responding differently to carburizing test

Manganese-Molybdenum Steel 40 MMC at 100 Diameters. Left to right:
As rolled
Heat treated to 269 Brinell
McQuaid-Ehn test



A property of fine grained steels which has not yet been mentioned is wide temperature range in heat treatment. Since they resist grain growth, such steels may be heated

considerably above the minimum temperature required for complete hardening without coarsening, with its attendant brittleness.

In practical heat treatment this point is of great importance. By virtue of it, "single treating" carburizing steels are made possible, in which a commercially satisfactory refinement of both case and core may be effected by a single heating and quenching operation. The single treatment possesses two advantages over "double treatment," namely, minimized distortion and lower cost by eliminating the first or core refining treatment.

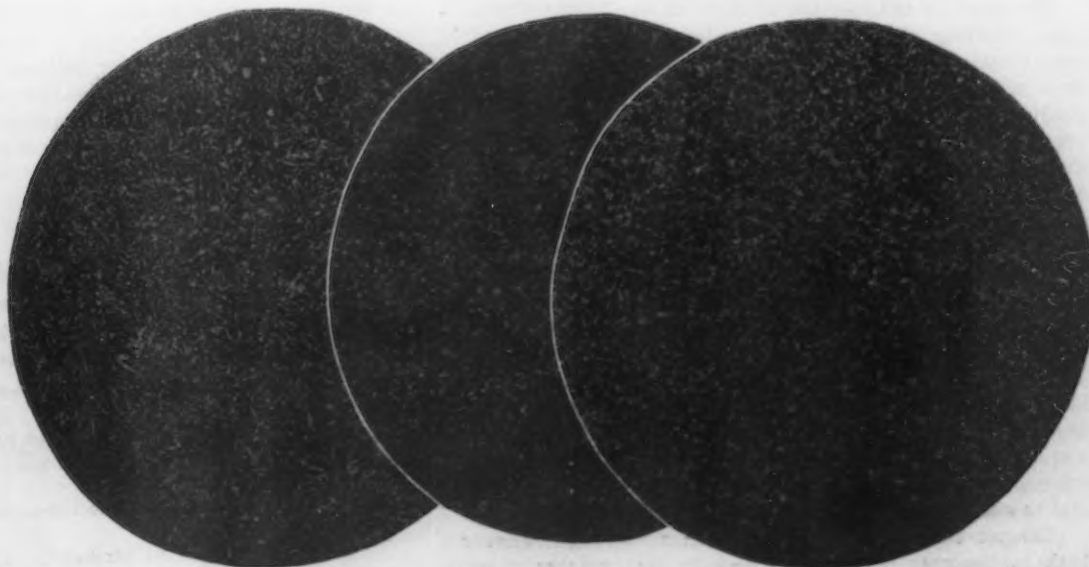
In other than carburizing grades, fine grained steels are more "fool proof" in heat treatment—an equally advantageous characteristic. Such steels lack the extreme sensitivity that necessitates working within narrow limits of temperature and time. One may therefore safely adopt quenching temperatures well above the critical range, since errors due to non-uniformity of temperature in the furnace or minor errors in the pyrometer system will not be accompanied by overheated or underheated structures.

General Considerations

It has been pointed out that many of the important physical characteristics of steel, including machinability, hardenability and mechanical properties, are definitely affected by grain size in the McQuaid-Ehn test. It might reasonably be anticipated that these differences would be explained

Low-Manganese Steels				
Heat	26 MC	26 MF	40 MC	40 MF
Quenching temperature...	1525 deg. Fahr.	1525 deg. Fahr.	1500 deg. Fahr.	1500 deg. Fahr.
Quenching medium.....	Water	Water	Water	Water
Drawing temperature....	900 deg. Fahr.	800 deg. Fahr.	1000 deg. Fahr.	850 deg. Fahr.
Yield point.....	110,400	107,100	140,000	143,300
Ultimate strength.....	132,800	129,900	156,000	159,300
Elongation in 2 in.....	18.5	21.0	16.5	15.5
Reduction of area.....	58.8	65.1	50.7	57.8
Brinell hardness.....	269	269	321	321
Grain size.....	No. 6 (coarse) Fig. 1	No. 10 (fine) Fig. 2	No. 6 (coarse) Fig. 3	No. 10 (fine) Fig. 4
Izod value.....	67 ft.-lb.	78 ft.-lb.	14 ft.-lb.	53 ft.-lb.
Manganese-Molybdenum Steels				
Heat	26 MMC	26 MMF	40 MMC	40 MMF
Quenching temperature...	1525 deg. Fahr.	1525 deg. Fahr.	1500 deg. Fahr.	1500 deg. Fahr.
Quenching medium.....	Water	Water	Water	Water
Drawing temperature....	1100 deg. Fahr.	1100 deg. Fahr.	1030 deg. Fahr.	1030 deg. Fahr.
Yield point.....	115,300	116,000	144,100	145,000
Ultimate strength.....	128,800	129,000	159,300	159,500
Elongation in 2 in.....	20.5	21.0	18.0	18.0
Reduction of area.....	63.2	66.7	56.6	57.1
Brinell hardness.....	269	269	321	321
Grain size.....	No. 6 (coarse) Fig. 5	No. 10 (fine) Fig. 6	No. 6 (coarse) Fig. 7	No. 10 (fine) Fig. 8
Izod value.....	74 ft.-lb.	91 ft.-lb.	55 ft.-lb.	64 ft.-lb.

Steel 40 MMF. Similar in chemical composition to 40 MMC above but responding differently to carburizing test



by difference in the microstructure in the "as rolled," and more particularly in the heat treated or "as tested" conditions. A study of the pictures, which show the microstructures in the "as rolled," "as tested" and "after McQuaid-Ehn test" conditions of the manganese and manganese-molybdenum steels we have used in the work to illustrate our remarks, shows that in the "as rolled" and "as tested" conditions there is little to distinguish a given coarse grained steel from its companion fine grained steel. The McQuaid-Ehn test, however, brings out fundamental differences in an obvious manner.

The carburizing test thus provides a simple and positive method of distinguishing between steels with a certain group of characteristic physical qualities and those with another but equally characteristic group. One may therefore predict with a considerable degree of confidence the suitability of a particular steel for a given application. It

is also clear that, for some applications, the group of attributes characteristic of coarse grained steels is desirable, if not essential, while other applications require fine-grained steels.

In view of these considerations it is inevitable that large users of steel, to whom definite physical characteristics are of prime importance, will use this test as a means of control, and perhaps incorporate grain size limits in the purchase specifications. This in turn would make it necessary for the steel maker to control the grain size of the steels he produces. For such work, the basic electric process offers peculiar advantages and has yielded excellent results. As was pointed out at the beginning, the ability of the large tonnage, high powered basic electric furnace to produce steels to close chemical and physical limits at a reasonable cost has led to an expansion in the use of electric steels which is most significant.

Business Press an Agent of Progress

President of United States Chamber of Commerce Points to
Valuable Services of Trade Publications

RAPID current changes in the business world demand that the trade press play an even more important role than in the past, according to William Butterworth, president of the United States Chamber of Commerce and head of Deere & Co., Moline, Ill., who addressed the Associated Business Papers at New York, Nov. 16. His remarks, in part, follow:

Enlightened business, eager to fulfill its destiny in the world, asks freedom of initiative. Properly so. But even paramount to individual right is the public right, and the individual who forgets that larger right must bring upon himself and his enterprises, and indeed more or less upon the entire business community, outbursts of public wrath in terms of legislative and Governmental regulation that may hamper and hamstring a legitimate liberty of business initiative.

Lawless, destructive initiative must be curbed. It must be curbed in the public interest and it must be curbed in the interest of lawful business. Organized business must and is lending a willing hand to this curbing through its own efforts at self-restraint and self-regulation. This aspiration is most worthy, and it is to the credit of the business press that it is bringing its influence more and more into aid of such efforts.

Moreover, in the solution of many of our business problems involving the public responsibilities of business, the sympathetic attitude of Government is necessary. This does not mean that business is—or should become—a petitioner for paternalistic legislation. But it is right and proper that business seek support for legislative policies that open the way for the collective wisdom of business to work out its own welfare, mindful that its largest good is always the public good. As the exponent of such aspirations the business press has before it an opportunity for most distinguished and most effective service.

Thus the success of business in measuring up to its public responsibilities depends in no small measure upon the courage of its organizations and the vision of its press. The organization is the business forum; the business senate. Here business canvasses and clarifies its opinion and arrives at its decisions. The business press—if it fully measures up to its opportunity—is the "guide, philosopher and friend," valued in counsel because it is as free to caution and to admonish as to approve and acclaim.

Let me elaborate that idea. I am a thorough believer both in business organization and in the business press.

Both are potent allies of business and industry. But let me say that the business press should not content itself merely with reporting business deliberations and business decisions. It should take part in them. And in saying this I have no thought to detract from the value of the reporting function. That I know to be most valuable—that interchange of business experience. It enables me as a manufacturer in Illinois to profit by the successful methods of others, and it enables me to avoid errors that have been discovered elsewhere. That, I repeat, is a service of the highest order.

But as a business man, as a manufacturer, as a member of trade and business organizations, I need, too, the candid advice of the business press. The business paper with its trained observers scanning the business horizon naturally has a wider view and an even better perspective upon the inter-relation of business events and movements than either the trade association or the individual business man. The value of this detached viewpoint and of the frank and friendly counsel of the business press cannot be too highly estimated. The business press has universal contact with business, it has the opportunity to mirror business to itself, and fearlessly to advocate sound policies and win for them the approval of both business and the public.

Moreover, never was the opportunity greater than now for the business press to make itself indispensable to business and industry. Never had it a like opportunity to stimulate leadership. For our business world is a rapidly changing world. In all its phases its processes are undergoing almost revolutionary readjustments. These require a new strategy, new tactics, new methods and, above all, unflagging fortitude and courage.

Standard Colors for Steel Foundry Patterns

According to a code of acceptable trade customs, adopted in 1928 by the Steel Founders' Society of America, the following colors should be used on patterns:

Surfaces to be left unfinished are to be painted black.

Surfaces to be machined are to be painted red.

Seats of and for loose pieces are to be striped red on a yellow background.

Core prints and seats for loose core prints are to be painted yellow.

Stop-offs are to be indicated by diagonal black stripes on a yellow base.



Heavy-Duty Anti-Friction Bearings

Advantages Due to Power Savings, Reduction in Maintenance and Continuity of Operation—They Permit Some Things Otherwise Unattainable

BY SIDNEY G. KOON*

THERE are few machines the running of which may not be improved by anti-friction bearings. The action of articulations and of mechanical movements of any kind is improved by proper bearings, and the highest type of these is anti-friction. Even for bearings occupying a minor part in the machine, some form of anti-friction bearing may be said to be better and cheaper in the end. Our automobile development is largely predicated on ball or roller bearings.

In most cases the initial cost of an anti-friction main bearing may well be less than that of the plain bearings, when everything is considered. The plain bearing requires expensive white metal or brass; there is much scraping labor at high cost; and then in the installation in the machine the bearing has to be run in at further skilled-labor cost. With the anti-friction bearing, on the other hand, none of this cost is entailed; the bearing is finished in the plant where it is made, and it is then put into the machine ready to operate.

Roller bearings are designed with the expectation that they will last as long as the machine. While it cannot be claimed that they are free from trouble and occasional breakage, in general they are so much more dependable than the plain bearing that the maintenance cost of the latter is almost wholly an unbalanced charge, when the two are compared. Maintenance is the largest item with regard to a plain bearing. When such a bearing or a part which it serves becomes too hot, it may cause the shutting down of a whole train of equipment, with interruption of service, and involve a heavy loss of revenue.

Uniform Sheets Made Possible

Only three-tenths of the power originally employed on a sheet mill was required for rolling the product and overcoming what friction remained after roller bearings were installed.

Even this great economy in power, however, was not a compelling element in dictating the use of anti-friction bearings in sheet mills. The one item which did effect it was the fact that it was found extremely expensive to obtain uniform thickness to close limits across the width of sheets rolled on mills with plain bearings. And lengthwise of the sheet the uniformity often was so poor that measurements taken in fractions of one-thousandth of an inch showed that the material could not be used for certain exacting purposes.

This illustrates something which has been observed time and again in the installation of anti-friction bearings, namely, that the major economy or improvement is almost always not the one which is anticipated to have major value.

Life of Apparatus Prolonged

An installation in a tube mill operating on the Mannesmann principle is a case in point. A tailstock holding a mandrel bar was fitted with a multiple-collar bearing of the

marine type similar in appearance to the thrust bearing on a propeller shaft. The mill was producing about three tubes a minute. Sometimes this bearing was run only half an hour before renewal of the lining was necessary. The loss on the mill due to lack of production, expensive equipment idle, and ingots getting overheated became a very serious proposition.

Roller bearings were put in to replace the multiple-collar bearings. These are grease-lubricated and have been standing up for six months at a time, or longer, between adjustments.

A great economy here, however, in addition to overcoming the difficulties mentioned previously, was in the prolongation of the life of the piercer point. This point wore away very rapidly under the original conditions, because of the retardation to rotation, caused by friction. With the roller bearings the mandrel quickly rotates up to full speed, and saves wear on the point. The whole cost of this change-over was defrayed by the savings of a few weeks of operation.

Benefits Obtainable

Benefits to be expected from the use of roller bearings in mills are fourfold. They may be classified as (1) power savings; (2) reduction in maintenance; (3) practical elimination of repair costs; and (4) continuity of operation of the mills.

Much heat is generated in the journals when plain slide bearings are used. A considerable portion of this heat travels from the roll neck into the body of the roll and tends to swell it or otherwise to distort its shape. This makes it difficult to maintain exact sections or thickness in rolling. Roller bearings completely eliminate this source of trouble. While the working surface of the rolls becomes slightly heated by friction against the material being rolled, the influence of this heat can be readily controlled. In any case, it occurs equally whether the bearings be solid or anti-friction.

Considerations Regarding Design

MANY formulas have been developed by manufacturers engaged in designing and producing roller bearings for various purposes. Other formulas have been developed by theorists in dealing with the forces involved. But inasmuch as material such as steel distorts in use under heavy loads, the mathematical theory cannot apply directly to the specific case. Consequently, although a manufacturer may use the formulas in the preliminary stages of his design, he generally checks them against his accumulated experience, and almost always departs from them to suit varying conditions to be met. Any ball or roller bearing can carry a greater load than the theoretical formula provides.

As an instance of this may be cited the design of a roller bearing for a 400-ton revolving crane for pier use, in which the outreach over the edge of the pier was 50 ft. or more. Tests made with the bearings designed for this crane, under a load somewhat greater than that to which they would be subjected in practice, showed the surface of contact de-

*Associate editor THE IRON AGE. This is abstract of a paper read before the Iron and Steel Division at the annual meeting, New York, Dec. 7, of the American Society of Mechanical Engineers.

veloped between the cylindrical roll and a flat surface plate to be no less than 5/16 in. in width. Of course, neither roll nor plate—hardened tool steel as they were—was stressed to its elastic limit, both resuming their original shapes when the load was removed. Careful microscopic examination failed to show any remaining deformation in either element. But elastic compression in the material had provided adequate bearing area.

Because of this great width of contact line, in contrast with the hair-line of the theoretical formula, it became possible to load this particular set of rollers to as great as 19,000 lb. for each inch of length.

Revamping Old Mills Not Adequate

In designing a roller-bearing mill, the first idea is simply to put roller bearings on the necks of existing or conventional rolls. Where the problem has not been thought out more carefully than this, there have been many cases of failure. Study of the failures has shown either too high a pressure or too great a speed, or that the neck of the roll was too weak. This latter condition resulted from reducing neck diameters to permit the bearings to go into the limited space available.

High speed introduces serious complications in roller bearings as well as in other types. Small thrust bearings made some years ago for a machine which was to operate at 3600 r.p.m., and which were made at a tolerance of only 0.0001 in., gave a peculiar sort of musical note when up to speed. It happened that the rotative speed of the machine corresponded with the natural harmonic-vibration cycle of the bearing, with the result that at that exact speed the sound was caused. Several of these harmonic points may be reached by such a machine in getting up to speed, whereas a slight variation in some of the parts may remove any cause of trouble resulting from harmonic vibration at the designed speed.

Reversed Stresses Are Severe

Rapidly alternating tension and compression in the material of roller bearings constitute more severe usage than is customarily experienced in the working parts of other machinery in which the alternate application and relieving of only one kind of stress is encountered, either tension or compression. It is well known that the extremely rapid repetition of stress alternating from tension to compression produces early fatigue. On account of this severe nature of stressing, the loading of roller bearings is frequently limited to only 1 per cent of the static load which could produce rupture of the parts.

Three essentials characterize the building of roller bearings today: The first is steel of proper composition and properly manufactured for both rollers and races. The second is accurate temperature in the heat treatment of the finished parts, which customarily must be kept within plus or minus 8 deg. of the specified temperature, and should be kept within 3 deg. The third is the extreme precision of the final finishing on the grinding machine.

For speeds as high as 400 or 500 r.p.m., it is strongly felt that the inner races should be locked in position on the roll neck. This may be done by clamping, by a shrink, press, or tapered fit, or by a combination of these methods. If this is not done, wear and scoring may result between inner race and journal. But with any type of bearing requiring endwise adjustment, the race must be free to slide on the neck.

Tapered and Cylindrical Rollers

Both tapered and straight cylindrical roller bearings are likely to find a place in rolling-mill work, for each presents certain advantages. But the results so far are not in sufficient detail, and particularly not yet in definite enough contrast to make possible intelligent selection of the one rather than the other.

In either case it probably will pay to install over-capacity anti-friction bearings for this service. Though they are costly, mill delays are far more so. And it is much better to face a high initial investment in bearings which will stand up for a long period than to have expensive mill delays and the more frequent replacements which might naturally follow the installation of bearings of smaller capacity.

Heavy Guns Use Anti-Friction Bearings

Anti-friction bearings have been introduced widely into the mechanism of gun carriages. The lower pintle thrust bearing for the United States 14-in. railroad mount—by far the most powerful gun used by either side on any front during the World War—has 34 balls 4 in. in diameter in hardened steel races having a diameter of 51½ in. at the center of the balls. The traveling weight of this mount is 730,000 lb.

Both races and balls are made of chrome-bearing steel, hardened and ground, with a Shore scleroscope hardness of 90 or above. The races are capable of carrying a sustained load of 100,000 lb. on one ball, applied at any point in the circumference of the groove. Each ball will stand a load of 100,000 lb. when placed between the finished races without showing any permanent deformation or surface cracks.

Some of the pressure tests on bearings have shown the maximum loads to which the roll neck may be subjected in operation. As the maximum load may occur only at long intervals, and, further, as it may be only momentary in application, it does not furnish a wholly satisfactory figure for the designer to use. Neither, in fact, does the average load, for the bearing must be fully capable of taking an overload which may in some cases be severe. Just where, between the maximum and the average, lies the load proper to use for designing is for future experiments and experience to determine.

Vital factors in designing bearings stated recently in connection with bronze bearings for heavy duty, will apply also for the most part to roller bearings. These include the following:

- Horsepower to be transmitted
- Revolutions per minute
- Load per square inch of bearing area
- Character of workmanship in machining parts
- Type of material used and its hardness
- Whether grinding to accurate measurement is to follow hardening
- Proper allowance for oil film
- Kind of lubrication to be used
- Lubricating device (if any) to be employed
- Type of service—intermittent or continuous
- Consideration of the heat to be developed by friction, and its proper radiation and control.

Operating Conditions and Requirements

CONTINUITY of manufacturing operation is today one of the most important elements in our industrial fabric. Continuous processes, particularly where operating with a long train of equipment, give economies not possible under the old conditions. Interruption to this continuity is bound to be exceedingly expensive. A large plate mill installed in Eastern Pennsylvania, for instance, has a charge of \$90 an hour for interest, etc., against every operating delay. It is evident that even a 15- or 30-minute shutdown to replace a brass on a \$3,000,000 mill, if recurring frequently, is something which industry cannot permit.

In rolling sheets or strips any change in the shape of the roll due to heat is important. Heat is conveyed to the roll from the material being rolled, and from the heat generated in brass or babbitt bearings. By the use of anti-friction bearings on supporting rolls, the heat in the necks is reduced to a more or less fixed quantity and the operator has only to shape his rolls so that they will adjust themselves to the accumulated heat derived from the material



being rolled. This tends to make it easier for the operator to maintain the shape of his mill. Because of the thinness of the product, this matter is of a greater importance than when rolling heavier sections.

Backed-Up Rolling Mills

Large-diameter backing rolls on cluster mills and four-high mills are depended upon to stiffen the working rolls and to limit their deflection, so as to produce a rolled strip or sheet with a minimum amount of variation between center and edge. When the supporting rolls are equipped with roller bearings, less adjustment is required to maintain the gage of the strip, as the operator has only to watch the wear on the roll surfaces, and does not have to make allowance for wear on the neck bearings.

With this equipment, properly designed, it is possible to roll strip or sheet steel practically without a "high center" and without crowning the rolls. The great diameter of the backing-up roll in relation to its length minimizes deflection of the working roll and enables the mill to produce the desired result. Roller bearings on the backing-up rolls make possible a high uniformity of gage, longitudinally, on many pieces rolled in succession, because the wear in the bearings is negligible.

There seems to be no question that a sleeve bearing, when first installed, will turn out material equally close in tolerance to that made when anti-friction bearings are employed. But the wear on the plain bearings is so much more rapid than on the anti-friction type that its tolerance changes more rapidly. Under these conditions the mill with the sleeve bearing demands a great deal more attention and adjustment. Plain bearings, of course, do not wear down equally, and some retain their forms longer than others. Nevertheless the general statement that they wear much faster than roller bearings probably will not be disputed.

Developed Side by Side

Thus the small-diameter working roll, backed up by one or more larger rolls, has been adopted for rolling wide, thin materials. By their very design and construction mills thus built avoid the space limitations around roll necks existing in regular two-high and three-high mills. It was quickly recognized by mill builders and roller-bearing manufacturers that here was an ideal opportunity for them to cooperate in applying roller bearings. And thus the activity of the bearing manufacturers in applying roller bearings to mill necks coincided with the reintroduction of backed-up rolls for mills rolling sheets and strip steel.

Backing-up-roll diameters may be established without regard to any factor except the space requirements of the roller bearing. In fact, the greater this diameter the better suited is the big roll to hold the working roll from deformation. It was the perfection of this combination which started the recent and remarkable change from the long-established practice for producing wide, thin metal products.

Older Types Still Useful

There still is a wide range of products which can be rolled satisfactorily on the older type of two-high mill without undue power drafts. In such cases, particularly under present steel-mill operating conditions of frequent roll changes, brought about by the "short orders" of "hand-to-mouth" buying, the installation of roller bearings might not be justified. Against their manifest advantages must be set the higher cost of roll changes in sets where they are employed. If analysis shows that the latter is likely to exceed the savings expected from their use, the lower initial cost of present equipment may well be decisive.

Freedom from shutdowns for repairs is one of the chief advantages derived from the use of heavy-duty roller bearings. On some mills it has been found necessary to re-babbitt bearings as often as every 8 hours, while properly applied roller bearings frequently do not have to be replaced

more than once a year. When rolling continuously it is essential that the bearings stand up to their work to avoid having to shut down the whole mill for replacements.

Savings in Power Consumption

COMPARATIVE power-consumption tests on mills run alternately with anti-friction bearings and plain bearings have yielded valuable data. Variations in temperature of the steel being rolled have made the tests less directly comparable than might be wished, but the information available is being augmented from time to time by additional test data. The earliest, and possibly the most complete, of these tests were made on a three-high 16-in. bar mill in Canton, Ohio. Records of the rolling of 279 billets, in tests made two and a half years ago, showed average savings of about 48 per cent.

In another case a two-high 10-in. rod mill was tested both with plain bearings and with roller bearings. With plain bearings the power needed without load was 95 hp., increasing to 170 hp. while rolling steel. With roller bearings the no-load requirement was only 20 hp., and 95 hp. while rolling steel. Here the saving of 75 hp. represents 44 per cent of the previous full load of 170 hp.

Questionnaire

UNDER the auspices of the Association of Iron and Steel Electrical Engineers a questionnaire was sent out last spring to determine the position of steel-mill engineers with regard to the application of anti-friction bearings to roll and pinion necks. Some of the results of that questionnaire are given in the following paragraphs.

Roll necks, in general, can be reduced in size if anti-friction bearings are applied. The point of application of roller bearings is closer to the body of the roll than in the case of plain bearings.

Backlash presents quite a problem because its elimination by means of drags would materially reduce the power savings afforded by anti-friction bearings. Ordinary coupling-box fits in many cases cause serious backlash. Better-fitted finish on coupling boxes and wabblers would help but not cure this condition. Such fits would have to have clearances estimated variously at from 1/16 to 1/2 in., with 1/4 in. generally favored. Universal couplings would be preferable to finished boxes and wabblers, except perhaps for small bar mills.

Freedom from Dirt Important

Prevention of dirt working its way into the bearings is one of the most serious problems. Proper lubrication of the bearings must be worked out in a simpler, yet reliable, manner.

That there is virtually no wear on roller bearings, either transverse or longitudinal, will, it was reported unanimously, eliminate much trouble in mill operation and prove of great value. It will help the mills to roll more accurate products. That it will lengthen the time between roll dressings is doubted.

The chief limitations to the installation of anti-friction bearings for this service were given as lack of necessary space on old mills, limits to roll dressing, high cost of equipment, and—mental inertia. Some of the disadvantages of such bearings were listed as increase in time required for changing rolls, inability to take end thrust, and inability to obtain full life out of rolls on small three-high shape mills.

General Conclusions

APPLICATION of roller bearings to the backed-up strip mill is still too close to the experimental stage to permit drawing any definite conclusions as to what its final form will be.

How much load a roller bearing will carry, and how long it will carry that load satisfactorily, are not yet known.

It is comparatively easy to determine the load which ordinarily comes on a roll neck. But there are excessive momentary loads far higher than this, and it is a very difficult matter to design a bearing which will carry these loads satisfactorily for a considerable time. The trend has been along the line of making bearings larger and larger with each new mill.

That this is an empirical method of attacking the problem, no one can deny. But it has resulted in developing equipment better suited to long life and inexpensive main-

tenance than would have been obtained by less bold design. So far we have not been able to determine exactly what does fix the size of a roller bearing.

Steel-mill engineers who have adopted roller bearings for rolls on backed-up mills, and who recognize their great utility for that purpose, do not favor their indiscriminate use elsewhere. As one such engineer puts it: "The present state of development in roller bearings for main mill rolls does not warrant our consideration of them except in cases beyond the limits of the two-high mill."

Limitations on Use of Anti-Friction Bearings

OPENING the discussion on the paper on Heavy-Duty Anti-Friction Bearings, F. C. Biggert, Jr., chief engineer, United Engineering & Foundry Co., Pittsburgh, who presided at the meeting, pointed out some of the limitations to the use of such bearings. There is a constant tendency to keep down their size, both on the score of cost and on that of convenience in handling. There are distinct limitations in regard to their use on two-high or three-high mills, because of the lack of adequate space between the roll necks in which to place the bearings. Where the material going through such a mill is narrow, as bars, they may work in these cases, but for broad material, heavy draft and large loads they are inadmissible.

Rarely do the rollers of such bearings give trouble; the races may do so because of the difficulty in obtaining uniform heat treatment on units of the size which the races take. They are frequently 30 in. or more in diameter and allowance must be made for the excessive loads sometimes placed upon them by reason of accidents. Mr. Biggert told of one instance in which a race of 18 in. in diameter was taken from the mill in a badly scored condition over the full 10 in. of width and for nearly one-third the circumference. There were minute particles of steel within the bearing but it did not give particular trouble, in spite of the damage it had received. This sort of damage was reported as customarily progressive, and usually the bearing gives no sign of distress until long after it has been seriously hurt.

Semi-annual or annual inspection of bearings were reported as inadequate by C. W. Bennett, vice-president American Sheet & Tin Plate Co. He advocated much more frequent inspection and said that with this it might be possible to obtain warning of internal troubles. Power savings were reported by Mr. Bennett to vary considerably with the type of mill and the character of product being rolled.

Heavy Savings from New Bearings

Referring to advantages not looked for when anti-friction bearings are installed, G. W. Weckstein, industrial equipment engineer Timken Roller Bearing Co., Canton, Ohio, said that his company has been able to get a more nearly concentric tube on a seamless mill after the new bearings were put in. The annual cost for brass and labor, in replacing or renewing plain bearings on this mill, had been \$6,059, without any allowance for overhead. The cost of a set of bearings for two rolls was given as about \$1,000. These were placed on the necks of the Mannesmann piercer rolls.

Mr. Weckstein referred particularly to the relation between cost of anti-friction and plain bearings on spindles of machine tools. He stated that the roller bearing in operating condition on the tool represented considerably less expense than was entailed after all the scraping and fitting had been done with the other type.

Complete study of pressures and power consumption is about to be undertaken by the Timken company, said the speaker. All three of the pressure measuring methods

mentioned in the paper are to be used, partly to learn their limitations and how they check each other.

Use of grease in excess quantities for the purpose of keeping foreign matter out of the bearings was advocated. In particular it was regarded as essential to retain the grease in the bearing and to keep water out. Because of the wear concentrated on one portion of the race of such a bearing, if it is fixed in position, the speaker said that longer life could be obtained from the equipment if, after a certain period, the race were turned 180 deg., so that the load might come elsewhere. He suggested a "creeping fit," whereby the loaded area might be shifted.

Oil-film bearings were warmly defended by H. A. S. Howarth, vice-president and general manager Kingsbury Machine Works, Philadelphia. He referred to the oil-film bearing as the best type of plain bearing, and described steel men generally as exceedingly conservative and hesitant to put in new devices. He said that the frictional coefficient at the moment of starting a piece of equipment is high with the oil-film bearing. Later on, however, this becomes much lower and approaches its best at the upper limits of speed. This type has great overload capacity.

Grease Under Pressure Keeps Bearings Cool

Positive grease lubrication on the necks of rolls on a 32-in. reversing mill rolling rounds was referred to by George T. Snyder, chief engineer National Tube Co., Lorain, Ohio. This mill has plain bearings and considerable water was formerly run on the necks to keep them cool. The grease lubrication installed provided for a pressure of 2000 lb. to the sq. in. and pockets around the necks were provided to hold the grease. The equipment is so adjusted that a little grease is supplied from the system every time the mill is reversed. No water is now needed on necks.

Strain gages in conjunction with steel blocks used well within the elastic limit of the steel was stated by Alvan L. Davis, research engineer Scovill Mfg. Co., Waterbury, Conn., to be the best method of measuring rolling pressures. He reported experiments upon a small sized mill placed under a large testing machine. The results were expanded mathematically from the 4-in. width in the experimental mill to 20 in. Strain gages now on the market were reported as sensitive and working beautifully.

Anti-friction bearings have been developed and pushed by their friends, according to William L. Batt, president S K F Industries, New York. Information has been pooled and all have benefited in the way the bearings have been improved and developed. This has not been the case with the plain bearing. No one in particular was engaged in pushing it. What was everybody's business became nobody's business and development of that type of bearing unquestionably has suffered in consequence.

A plea for using larger rolls with anti-friction bearings was made by W. Trinks, professor of mechanical engineering, Carnegie Institute of Technology, Pittsburgh. He recommended adding an inch to the diameter of small rolls, 2 in. to medium-size rolls, and 4 in. or thereabouts to larger rolls, when these bearings are to be applied. The

recommendation was based largely upon the inadequate room between roll necks for installation of anti-friction bearings on two-high and three-high mills.

Bearings Fellowship Suggested

At a luncheon meeting following the presentation of this paper and the discussion upon it, it became the consensus of opinion of those present that the work of the subcommittee on bearings could best be promoted from a

collection of all existing data, a survey of peak loads experienced in mills, and a study of means for avoiding the occurrence of these peak loads. A fellowship in the Carnegie Institute was recommended, the work to be done under the supervision of Professor Trinks, but with consultation with experienced men in and around Pittsburgh regarding methods and many other details. Representatives of bearing manufacturers, present at this meeting, offered to obligate their companies to share in the expense.

Functions of the Executive in Industry

Strong Plea Made for More General Adoption of Budget Control System in Manufacturing Plants

THREE main tools—men, money and materials—must be coordinated for best work in any manufacturing organization. The budget by which this coordination takes place is the most efficient tool known to modern industry, in the opinion of Robert T. Kent, engineering and sales manager Divine Brothers Co., Utica, N. Y., in a paper read Dec. 6 before the American Society of Mechanical Engineers, New York. It coordinates all four of the principal activities of a plant—finance, purchasing, production and sales. One of its chief advantages is that it permits comparisons of performance with the budgeted expectation, and thus points out where variations occur and to what extent. Hence, it shows where improvements can be made and how much room there is for them. The budget shows

1. The volume of business that can be expected
2. The volume of purchases, both of labor and material, that must be made
3. The production schedule that must be maintained
4. The probable inflow and outgo of funds
5. The financing that may or may not be necessary to carry on the business.

Budgets are of little use, according to Walter N. Polakov, engineer, New York, unless an executive can thereby measure the success of his efforts. He must compare with his postulates that which is accomplished. Any charted budget means more than merely a budget of money. It compares performance in various ways, accidental happenings, turnover of labor, etc.

Illustrating by an example drawn on the blackboard, which roughly is reproduced here, Mr. Polakov showed results which were obtained in a certain period in a plant employing 340 men. The monthly output of products was about \$200,000. The amount of stock carried was about \$100,000 and the monthly payroll, \$36,000. This was worked out on the dollar basis, partly because there were six different products made, which could not otherwise be grouped over any common denominator.

As will be seen in the chart, the plotting for any one month showed visually whether the volume of production was up to the bogey, or, if beyond that, by how much. The heavy black line indicates the quarterly accumulation of the three months in the quarter.

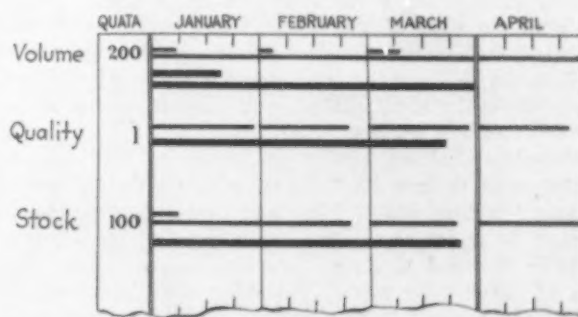
Quality was measured on the basis of spoiled work, allowances to customers for defectives and other items which could be placed on this same general basis. The allowance here was \$1,000 a month or $\frac{1}{2}$ per cent of the product. As plotted, it will be noted that this did not quite reach the allotted bogey in any of the months, and the quarterly total thus fell below what was permitted. Stock and other items can be plotted in the same manner.

Method of Subdivision

While the manufacturing budget is necessarily tied up to the main financial budget of the company, Mr. Kent said,

it is at the same time broken down for plant control into materials, labor and indirect costs. This is done by departments and the individual figures are accumulated into the total. The material figures are taken from the purchase orders. The labor is predicated upon the estimated machine-hours for the month's production. The indirect labor is a percentage of the direct or a unit based on the machine-hours. For the most part, in the shop the units of the shop are utilized and the amounts are not expressed in dollars.

Nevertheless, the department heads are kept acquainted



Illustrating One Graphic Method of Budget Control as Applied to a Plant Employing 340 Men

with the situation as to how much money they can spend for various purposes. This is subdivided into labor and other items and is given either monthly or quarterly. Each department head is thus made the manager of his own department.

Trying to Improve on Past Performance

Another speaker, reporting that he had never used a budget as such, stated that he has applied the general principles. In doing this, he took the best figures obtained for each department and endeavored to improve upon them. No limits to this process have yet appeared, as progress has been continual. He made a definite plea for not forgetting the human element in any budget making.

Dollar values can be carried down to the shop in their relation to the budget, according to the chairman, Thomas R. Jones, Cincinnati Milling Machine Co., Cincinnati. In plants with diversified products particularly, the materials, labor and other items have no other common denominator. While it is always possible to allow so much oil or waste for each 1000 ft. of pipe, or whatever else is made, the matter cannot be evaluated in a managerial sense without translating everything into dollars.

Skids for Interplant Shipments

Symposium Covers Economic Aspects, Railroad and Steamship Viewpoints and Development of Methods and Equipment

SIX papers were read before the Materials Handling Division of the American Society of Mechanical Engineers, at the recent annual meeting, dealing with the use of skids in shipments to distant points, as distinguished

from use of that form of equipment within the confines of a plant or between neighboring plants. Brief abstracts of the papers, and the discussion which they evoked, are given in the following paragraphs.

Developments in Materials Handling

IN the period from 1890 to 1910 a revolution was accomplished in methods of handling bulk goods, according to R. L. Lockwood, Division of Simplified Practice, Department of Commerce, Washington. This period saw the greatest development in the power shovel, the huge unloading and loading machines for railroad cars and ships, the great bridge and gantry cranes, the continuous conveyor and many other devices. During the early years of the twentieth century engineers made rapid progress in developing new methods for handling materials of construction, and an equally intensive development went on in methods of handling goods in process in factories.

Up to the time of the World War little attention had been paid to handling finished goods. During the period in which the skid and lift truck were extensively developed, a parallel development took place in connection with industrial tractors and trailers.

Materials-handling equipment of every kind can be counted upon to save its full cost within a definite period of time. Savings due to labor and time-saving equipment in many fields are sometimes partially offset by collateral losses in changed methods, inconvenience, or some other form of unavoidable waste. Handling materials is almost in a class by itself in this respect, in that savings made represent net gains shared by all elements in industry.

A fundamental economic principle has been concisely expressed in a form which might well become a slogan for the materials-handling industry: "Handling materials adds cost, but adds no value." It is to reduce this cost to the lowest possible measure that materials-handling equipment is employed.

Skids Are of Ancient Vintage

One of the oldest devices in the whole history of moving objects, the sled or sledge, had unrecognized possibilities, and after a long lapse of years was brought to life in the form of the modern skid platform or "skid." All sorts of objects could be loaded on it, and by the use of the lift truck the loaded platform could be picked up, taken to any desired place, and set down again.

Lift trucks grew in size and capacity, power being

applied to them in many cases. More and more plants began to use this method for handling a wide range of commodities. Loads increased steadily to a point where lift trucks are now made to handle loads up to 10 tons, although the average is 2½ to 3 tons. Once the ancient sled and the modern lift truck had been brought together, their use in combination spread so rapidly that it is estimated that about 9,000,000 skids and 110,000 lift trucks are in service in the United States.

During the period in which the skid and lift truck were extensively developed, a parallel development took place in connection with industrial tractors and trailers, particularly for use in railroad freight stations, warehouses and steamship terminals. Numberless forms of hand- or power-drawn trucks and trailers rapidly came on the market, all designed to reduce the time and the labor cost of handling miscellaneous goods.

Large Reductions in Cost

Handling costs in railroad freight stations were reduced from 25 to 75 per cent. A study made by the Transportation Division of the Bureau of Foreign and Domestic Commerce, covering miscellaneous commodities, showed that, of every dollar spent to get these commodities from the final machine or factory process into the hands of the consumer ready for use, 10c. represented the actual rail or water transportation cost and 90c. the cost of packing, handling, loading, unloading, rehandling, unpacking, etc., including the cost of packing materials.

This study, together with others of a specific nature, attracted wide attention on the part of engineers and executives, as indicating the vast and untouched possibilities for saving money in this field. This knowledge, together with the constantly narrowing opportunity for saving money in production processes, further accelerated the effort to reduce costs in handling finished commodities.

It was obvious that, if the same degree of engineering, inventive and administrative genius were applied to distribution that had already been applied to production, the results would be similar to those accomplished in production in this country.

Economic Aspects of Skid Shipments

SOME of the economic aspects of the skid method, viewed purely from the standpoint of the shipper or receiver of the material, were presented by C. B. Crockett of the Society for Electrical Development, New York. The method is described both as to equipment and its uses, and to its relation to the manufacturing processes. A comparison is made between the total cost of physical distribution and

the cost of freight transportation only, pointing out the small influence of the latter factor in the total cost. The field of savings is then discussed, including labor costs, speed of car loadings, the container or skid, and the damage to material. These are illustrated, with actual instances which have occurred in various industries.

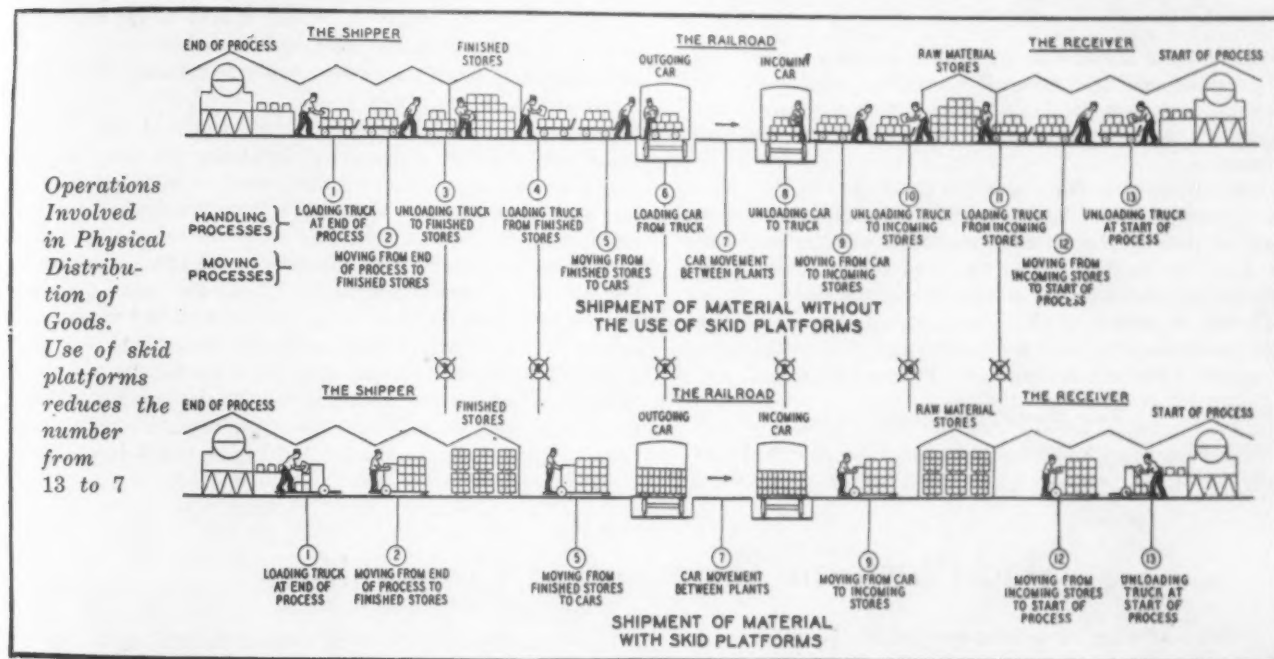
The paper concludes with a treatment of the possible

growth of the system and the four main factors which may influence its more general adoption: namely, (1) breadth of application to different commodities, (2) coordination of the system with methods of handling within the plant, (3) attitude of the railroads and other carriers, and (4) degree of interchangeability developed in the design of the equipment.

The essential factor in this method is the introduction of a container for shipment which adapts itself to mechanical handling in and out of box cars. Even with the use of portable conveyors there is still a large amount of

"load-carrying" truck (either hand or powered) in that they pick up the load mechanically and in the minimum time. The requisite for handling with this type of equipment is that the load be carried in a container that has a clear space underneath, which will allow inserting the platform of the truck underneath the load.

A packing case with legs becomes a skid box. The general practice today is to load the skid platform or skid box at the completion of the manufacturing process, storing the material in the same container, and upon shipment transfer the loaded skid to the car. If a platform is used for such



hand labor in the placing or removing of material in or from its location in a car. The only practical means (or at least the most generally accepted means) of mechanical handling in and out of box cars is by hand, electric or gasoline-powered industrial lift trucks.

Capacity of Laborer Multiplied

All of these types of lift trucks have a common characteristic in that they multiply the capacity of the workman and have the improvement over the fixed-platform or

material as kegs or small boxes, these are generally wired or strapped together, but do not have to be secured as strongly as one would suppose, because the entire load is generally secured after the car is loaded.

Many specific instances of savings made by this method of shipping, and of other opportunities for further savings, were cited by the speaker. He threw on the screen a diagram showing steps in shipping semi-finished goods from producer to the plant where further work is to be done upon them. This diagram is reproduced herewith.

Use of Skids for Water Shipments

ECONOMICAL handling of commodities in bulk has been highly developed, but great reductions in costs are possible with other classes of cargo by the use of advanced methods and equipment and the application of principles which have accomplished so much in manufacturing. The principles of greatest importance are the reducing of handling to the minimum and increasing the production of equipment to the maximum, according to H. E. Stocker, resident manager McCormick Steamship Co., New York.

In the shipping industry handling may be reduced by keeping freight off the floor of the pier and the deck of the ship. The best method of accomplishing this is to receive the freight from the manufacturer, already loaded on a skid. It broadens the application of the principle by extending it back to the mill where the goods are manufactured. Savings are increased not only by reducing handling at the mill and at point of consumption but by reducing packing expenses.

Saves Four-Fifths of Labor Cost

With a pier floor in good condition, one man and a tractor will handle skids averaging 3600 lb. with a total labor cost saving, as compared with shipments in cases, of

over 80 per cent. Even more important from the standpoint of net profit is the fact that additional business has been brought to the line by accepting shipments on skids.

In addition to the economy resulting from handling skids on the pier with lift trucks, the average sling load will be increased approximately 300 per cent, the ship's dispatch will be expedited, and the claims reduced. Total savings will be the equivalent of more than a 50 per cent cut in cargo-handling expenses.

Advanced principles of materials handling will add greatly to these benefits by reducing cargo-handling costs. The principles of most importance are:

- 1—Avoid unnecessary movement—i.e., straight-line production,
- 2—Maximum use of mechanical equipment,
- 3—Entire operation planned carefully to the last detail,
- 4—Select the one best machine, etc., for each particular job,
- 5—Select the one best method for each particular job,
- 6—Emphasize unit cost rather than first cost, and finally, emphasize net profits,

7—Provide for ease of movement

- a Ball-bearing or roller-bearing trucks, trailers, etc.
- b Good floors
- c Movement by power

8—Minimum of handling

- a Economy in moving material is obtained by not handling it,

9—Maximum production obtainable from the equipment and plant.

Savings in Handling Railroad Stores

TREMENDOUS quantities of stores are handled by every American railroad. These stores are to a large extent received in a central store room and are then forwarded as needed to local storerooms in various centers. Under ordinary conditions this procedure involves considerable re-handling, according to J. V. Miller, assistant general storekeeper, Chicago, Milwaukee, St. Paul and Pacific Railroad, Milwaukee.

During the past few years the C. M. St. P. & P. R. R. has succeeded in cutting down this rehandling by storing many of its supplies on skid platforms. When shipments are made up to send out to the local centers the supplies are thus to a large extent picked up directly on the original platforms by means of lift trucks, moved into the railroad cars, transported to their destination and there unloaded by lift trucks. Three handlings are thereby eliminated.

Vast Movements Involved

Approximately \$1,000,000,000 worth of materials annually must be handled by railroad stores departments.

Some railroads carry in stock 65,000 different items of material; some carry over 100,000 items. The supply department, more commonly called the stores department, of each railroad orders stores and distributes them to the using departments in much the same manner as a large wholesale house serves its customers.

Not less than 75 per cent of the work of the stores departments is that of handling materials, yet until a few years ago the major efforts toward more economical operation were directed along lines other than those of materials handling.

Taking up in order the subjects of brake shoes, air pumps, brake beams, locomotive tires, air hose, journal brasses and other items of large use in railroad work, the author showed to what extent each such item fitted into the general scheme of handling on skids. In some cases the "adherence" is 100 per cent, but some items prove difficult to take in that manner and here less benefit is obtained from the new methods. Particularly is it found impossible to handle long items on skids.

Skid-Platform Shipment of Commodities

AFTER outlining the development of the use of lift trucks for interior factory transportation, F. J. Shepard, Jr., chief engineer and treasurer, Lewis-Shepard Co., Watertown, Mass., briefly discussed their possibilities for inter-plant transportation and for use between cities through freight and motor-truck shipments. He showed how the methods of packing and transporting paper have been radically changed in the past two years through the use of skid platforms for shipment, and gave figures of savings effected in a number of instances.

One has only to go back 20 years to the starting of the lift-truck system. Up to that time everything was handled on wheel trucks. Lift trucks were first used on flat stock such as paper, lumber cut to size, etc. The only type of platform used was the flat-top type made of wood.

Every use for lift trucks developed since that time has been the result of applying a proved principle to a particular problem. And when it is considered that lift trucks are used today to handle over 300 different products and in loads from 300 to 10,000 lb. (20,000 lb. in the case of power-

lift trucks) with platform sizes ranging from 3 sq. ft. up to 48 sq. ft., we can appreciate how unlimited the possibilities are.

Saved 3 Per Cent on Selling Price

One large paper mill estimates that \$30,000 invested in returnable skids paid a 100 per cent dividend at the end of ten months' use, and since that time has shown a saving of better than \$120 for each working day, or \$36,000 a year. The direct saving at the mill, through this method of shipping, amounts to about \$5 a ton, or, roughly, 3 per cent of the selling price of the paper.

Manufacturers of lift trucks and platform skids are anxious to cooperate fully, not simply to make sales but to build better transportation systems; for they realize that if they do that, or help to do it, sales will result as a matter of course. They have a wealth of material along various lines, plus the experience gained in working out problems, and in most cases are able to offer helpful suggestions to those who may be considering special handling problems.

Skid Shipments of Materials on the Lakes

SKID platforms, stock skid boxes, power-lift and hand-lift trucks in the handling of cargoes in Great Lakes navigation were discussed by George B. Wright, freight traffic manager Detroit & Cleveland Navigation Co., Detroit. He pointed out that the greatest problem to be faced is the practicability of interchange between carriers and between carriers and industrial plants. The solution he believes can be arrived at only through discussion between representatives of industries, steam railroads, electric lines, steamer lines, city transfer trucking companies and storage warehouses.

Cargo carried by the combination passenger and package-freight side wheelers, ranging from 360 to 535 ft. long, is perhaps more diversified than that of other similar car-

riers on the Great Lakes. It ranges from packages a few ounces in weight to iron and steel articles and machinery weighing several tons—literally, everything from "a needle to an anchor."

In addition to this miscellaneous freight many thousands of automobiles are carried on their own wheels. To carry maximum loads of automobiles the miscellaneous freight must be stowed from deck to deck, with proper regard to the utilization of space in which an automobile cannot be placed.

Skids of Goods Can Be Stacked

It was found that skid platforms and boxes when evenly loaded with heavy, compact freight could be so placed on

the boat decks as to form in reality a deck of themselves, and that quantities of lighter freight could be loaded on top of their loads, so that the only space really lost was that between the legs, which was negligible. The scope of the work was then enlarged by employing power-lift trucks to do the work between the boats and the docks and using hand-lift trucks for moving the equipment only short distances. Today the company has in service about 400 skid platforms and skid stock boxes, which are interchanged between ports carrying local port-to-port freight only.

Interrogating himself, the author tries to answer these questions.

Many Points Raised and Answered

SKID platforms were first used for outside shipments in the pulp and paper industry about 12 years ago, according to Prof. Frank L. Eidmann of Princeton University, in opening the discussion. Two factors, however, have retarded the rapid adoption of this method. The first is a lack of interchangeability in the skid platforms and the second, the failure of management to appreciate the savings which may be achieved through their use. One thing not commonly noted is the reduction on demurrage charges, based on more rapid handling of goods into and out of freight cars.

Interchangeability of platforms between the carrier and the manufacturer must be possible for best results, according to James E. Mix of the Excelsior Lift Truck Co. Consequently, all such platforms must be made to the same standards. Illustrating the result of a lack of standards, Mr. Mix pointed out that his company makes more than 80 sizes of lift trucks—not from choice, but because there is specific demand for each size. He believes that the number should be cut to 12 or 15.

Handling stores in the general storehouse of the Illinois Central Railroad is done about 95 per cent on skids, as reported by W. S. Morehead, assistant general storekeeper. There are something like 47,000 items in stock. Such of this as cannot be skidded is the material of long length, such as pipe, steel bars, etc. Skids are used for this purpose by this railroad for three reasons: the saving in labor, in storage space and in stock investment.

When to Buy Skid Equipment

As a general guide in this connection, Mr. Morehead said that a lift truck and 200 skids should be installed whenever the working force reaches six men. With this equipment, the force of six may be cut to four and the work done more expeditiously and at less expense.

One interesting suggestion made by Mr. Morehead with regard to the locating of skids on a narrow aisle was that they be placed herringbone fashion (as shown in the sketch), so that the lift truck can get at them. Under this arrangement, a 6-ft. aisle will be just as easy to work as a 12-ft. aisle, which is required if the skids are placed rectangularly.

Taking up five questions propounded in the paper by George B. Wright, Matthew W. Potts of the Alvey-Ferguson Co., New York, gave categorical answers to each question. As to who will furnish the equipment—the shipper or the carrier—he said that this comes down to a question of which one will save the most money. In any case, the major portion of the saving will or should be passed on to the consumer, and the ownership of the skid becomes matter for mutual arrangement between shipper and carrier.

Wire-Mesh Container Suggested

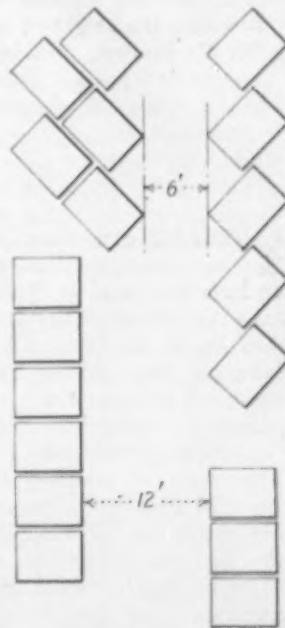
Checking loose freight going through several hands sometimes involves drastic precautions. Mr. Potts suggested a wire-mesh container erected on a skid and fitted

- 1—Who is going to furnish the equipment, the shipper or the carrier?
- 2—How is the freight going to be checked by the carriers? This involves the checking from shipper to first carrier, first carrier to second carrier, and so on, and last carrier to consignee, or last carrier to drayman to consignee.
- 3—How is the owner of the equipment going to get it back?
- 4—How are the repairs going to be handled? There is a constant upkeep on this type of equipment.
- 5—Where the loads are preponderantly one way, how is the equipment going to be equalized?

with a lock or other form of seal. The shipment then can be handled as a unit without necessity for checking over a multitude of small items to ascertain whether pilferage has occurred.

As to how the owner of the equipment (skids) can get it back after shipping out goods on it, this is handled in many cases by shipping the skids back as a separate freight item. As a matter of fact, much of the work of the Department of Commerce on standardizing skids paves the way for re-use of the equipment in many places and makes it possible to make a definite charge for the skid, which

Illustrating Locating of Skids Herringbone Fashion, to Permit Use of a Narrow Aisle. Owing to the full turn needed by the lift truck for the usual method of location, a 12-ft. aisle is required, whereas 6 ft. will do, with 45-deg. angle of "parking"



charge is refunded or canceled if and when the skid comes back.

Repairs on a type of equipment on which continual upkeep is a factor will naturally be made by the owner. Where the loads are preponderantly one way, equalization of the equipment again takes the form of making a charge for each skid and a credit on its return.

Interchangeability Has Been Fostered

It was pointed out by R. L. Lockwood of the Division of Simplified Practice, Department of Commerce, Washington, that standards for skids have been discussed by the department but not yet adopted. The general feeling is that standards should result in making skids of multiple sizes, wherein the larger is twice the area of the smaller, etc. Opinion is about crystallized on sizes so that two of the large ones or three of the small ones can be placed abreast in a box car.

However, great progress in interchangeability of skids

has been made without standardizing the over-all dimensions. Standard heights have been widely adopted, so that the tables of lift trucks can be inserted comfortably, and clearance widths between legs have been broadly accepted for the same purpose. This makes it possible to handle a wide variety of skid sizes with such variety of lift trucks as the market affords.

Shipments of steel on skids, particularly in the form of cold rolled sheets, was referred to by B. F. Neidinger, Singer Mfg. Co., Elizabethport, N. J. Because of danger of corrosion from the elements, this steel is shipped in box cars. The speaker asked whether it could not just as well be put in open cars, with enough protection from the weather, and then handled from the car by a crane and put on the company's own skids for working through the plant.

Costs of Unloading Cut Heavily

Unloading costs on box cars were referred to by F. D. Stemp of the General Electric Co., Bloomfield, N. J. With sheets unloaded by hand, the cost was placed at 65c. a ton. Upon using a dolly this cost became only 8 to 14c. a ton, depending somewhat on the way it is packed in the car. This question of packing in the car was referred to by C. N. Bonnell, Jr., of the American Railway Association, New York, chairman of the meeting. He stated that frequently, owing to bumps which the car receives in transit, the material gets shot over until some of it is directly in the doorway. It then frequently becomes impossible to use skids in unloading until the doorway is cleared, which may take three or four men a period of three or four hours.

Reducing the height of the legs of skids was advocated by W. C. Brinton, president Terminal Engineering Co.,

New York. He referred particularly to a reproduction shown on the screen by one of the speakers, wherein skids of goods were stacked three high. The space between bottom of leg and the platform on which goods rested was, in this instance, about 25 per cent of the total height of skid and goods. If the handling equipment used were confined to power equipment with an over-hung end, the height of the skid could be reduced, Mr. Brinton said, from about 12 in. to 4 in., with consequent saving in storage space.

Undue Concentration of Load

Continuous runners on the bottom of the skid were referred to by this speaker as an aid, where material is stacked one skid above another. The legs concentrate the loads enormously on small bearing areas, compared with the way the runners would distribute those loads more equally.

Several examples of return of skids from user of material to the shipper were reported by Mr. Clark of the Clark Equipment Co., Buchanan, Mich. These instances were shipments in carload lots. They covered automobile brakes sent out by the Bendix Brake Co., South Bend, Ind., axles supplied by the Clark company on a specially designed skid, and automotive engines shipped by the Continental Motors Corporation, Muskegon, Mich.

Under-hung trucks with less than 2 in. clearance have been introduced this year by his company, said the speaker. He stated that all the leading manufacturers of power-driven hauling equipment maintain laboratories to study these problems of materials handling, and stand ready to send out experienced engineers to solve the handling problems of their prospective customers.

Tool Alloys Containing No Carbon

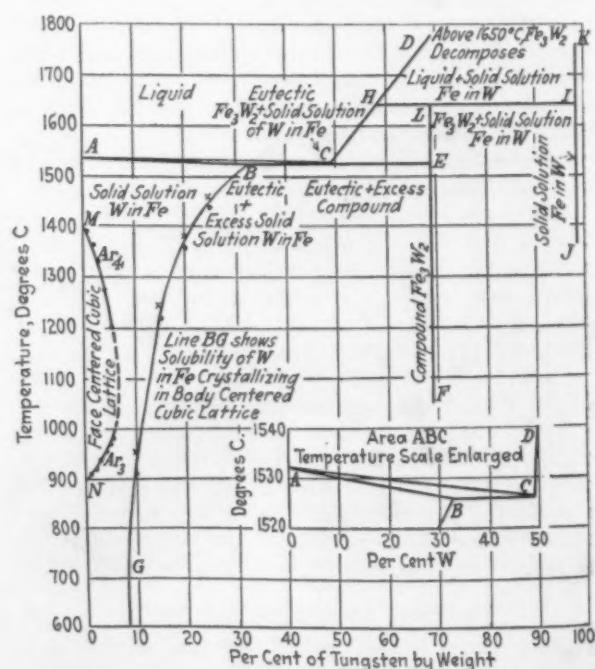
A RECENT announcement from the War Department that cutting tools containing molybdenum but no tungsten have been used at Watertown arsenal, revives interest in the theoretical studies of the iron-tungsten system published by W. P. Sykes before the American Institute of Mining and Metallurgical Engineers in 1926. These alloys contained less than 0.005 per cent carbon, and produced the equilibrium diagram illustrated.

It will be observed that tungsten in such an alloy has the property of lowering the temperature A_r , at which delta iron changes to gamma iron, and also raising the temperature A_r , at which gamma changes to alpha iron. These two transformations are eventually suppressed and no gamma iron is found in carbon-free alloys containing more than 7 per cent tungsten at any temperature. An alloy containing 7 to 9 per cent is permanently austenitic, and cannot be hardened or tempered by any heat treatment. Similar changes in the transformation temperature of pure iron are caused by other metals; permanently austenitic alloys are formed with high chromium, silicon, tin, vanadium, or molybdenum.

As shown by the diagram, the alloys with higher tungsten contain a second phase: the compound Fe_3W_2 , whose solubility decreases with the temperature (line BG), but which is precipitated throughout the metal only at a slow rate. To harden an alloy with 20 per cent tungsten, then, it is necessary to anneal or "age" it at a temperature somewhat below 1400 deg. C. for several hours or days. In the paper quoted Mr. Sykes gave the hardness of a carbon-free solid solution alloy containing 80 per cent iron and 20 per cent tungsten as 160 Brinell, and the same after aging as 330 Brinell.

In discussing this paper, Dr. Zay Jeffries said that carbon free iron-molybdenum alloys would develop even higher hardness on aging, quoting 530 Brinell for the hardness of

a 22 per cent molybdenum, 78 per cent iron alloy. "Alloys of the iron-tungsten and the iron-molybdenum systems, as hardened by aging, have been recently used in place of high-speed steel for certain purposes at the Cleveland Wire Division of General Electric Co. The results have been most satisfactory in that the useful life of these alloys is from 10 to 40 times that of high-speed steel," said Mr. Sykes, in the closing paragraphs of his paper.



Iron-Tungsten Equilibrium Diagram

What Magnetic Testing Reveals

More Knowledge of Uniformity and Continuity of Steel—
Facts Which Other Methods of Test Bring Out—
Limitations of All Tests

BY A. V. DE FOREST*

IT is a pleasant belief that there is a pot of gold buried beneath the end of every rainbow. Many have been disappointed when they set out to dig because, however definite appeared the location of the rainbow, when they finally reached the spot it had unaccountably moved further away.

If the gold digger happened to be a philosopher, he would study the nature of rainbows and discover that they are really circular and therefore have no end, and therefore that the story is not true at all. Thereafter he would refrain from studying the mechanical properties of steel, their chemical constituents, their microscopic appearance and particularly their magnetic characteristics. Each of these methods has been developed by workers who believed that complete knowledge of the mechanical behavior of steel could be reached with their tools; whereas it seems probable that the closer the search and the more accurate the method pursued, the further the rainbow recedes.

Early Claims for Chemical and Mechanical Tests

In the days when chemical analysis was first applied to steel all the peculiarities of that material were going to be explained by its ever varying proportions of carbon, manganese, silicon, phosphorus and sulphur. When Stead first examined steel through the microscope and discovered almost as many strange things as did Galileo with his telescope, a new explanation of mechanical properties developed. When the physical chemists started to teach Gibb's phase rule to metallographers, another series of facts in regard to steel was uncovered. The anatomists of the mechanical school, who sacrifice hecatombs of specimens to their testing machines, still impose their solution of all problems and in spite of the absurdity of specifying ultimate strength in cases where repeated impact is important or elongation when hardness is needed, they logically control the court of last resort on mechanical materials.

With all the methods of study, chemical, microscopic and mechanical, not to speak of the X-ray and magnetic analysis, our pot of gold seems as good as in hand—at least many of us on the scientific fringe are busy selling it. I take it our goal will be reached when we can predict the behavior of any individual piece of steel under definite conditions.

Success Depends on Mechanical Test Selected

The extent to which we are successful depends largely upon the mechanical test which we choose as a criterion of behavior. Take, for instance, a property such as the tensile strength of hot-rolled steel. Depending as it does on the average behavior of enormous numbers of separate grains, it is fairly well known for varying compositions and mechanical treatments. We can be reasonably sure that the strength of one specimen will be very closely equal to that

of other specimens cut from either side. In a test in which the properties of a much smaller volume of metal is involved, as, for instance, in a notched bar impact test, the variation would be more marked, and when we come to a really difficult case such as predicting the exact spot in a length of several feet of steel bar, of uniform section and treatment, which will break in the testing machine, we are at the present time almost helpless.

Assume Uniform Materials

Our methods of test are all based on the assumption that our materials are sufficiently uniform from one elementary volume to the next, so that the mechanical properties of a specimen destroyed in the testing machine may be assumed similar to all other parts of the same bar or even the same heat or grade of steel. The accuracy of this theory of vicarious test depends on the elementary unit of volume assumed. If it is large, the average results will be correct, but it would inspire greater confidence in the individual case if there were a non-destructive method of assuring the identical properties of the material and the test specimen representing it. It is this assurance which we unconsciously seek when we improve our steel making, our rolling mill practice, our heat treatment, and our methods of test, all devoted to the production of greater and ever greater uniformity.

The attempt to estimate this uniformity by a non-destructive test implies that whatever property is tested and found to be uniform will also indicate a sufficient uniformity of the desired mechanical properties.

Neither Magnetic nor Mechanical Tests Accurately Developed

In the case of the magnetic characteristics, there is much evidence that very close relationships exist between the two sets of phenomena. Unfortunately, however, neither magnetic nor mechanical tests have been developed to the point at which accurate comparisons can be made, involving the properties of small volumes. For instance, in a fatigue test the mechanical properties along a single plane will determine the life of the specimen. It is a simple matter to magnetically test the general properties of a considerable mass of metal and obtain good correspondence with other properties involving the whole volume, but in this case so far it is impossible to test magnetically the properties of a single plane.

We may, therefore, conclude that our test is a failure, whereas in reality we have translated a test involving a volume of metal in terms of a property involving only an area, and committed the same error which would occur in attempting to translate from the tensile strength of our specimen to the fatigue life. In both cases the average of a large number of tests will show good correspondence, but the life of the individual is still problematical. The disposition of the fatal plane is accidental and will average out in case of a large number in individuals. As in the case of life insurance tables—the mortality of a group may be

*Based on the author's comments when presenting his motion pictures of magnetic tests before the American Iron and Steel Institute in October, 1928. Mr. de Forest is research engineer American Chain Co., Bridgeport, Conn.

known with great accuracy, whereas the life of a single individual is largely a matter of chance.

The properties along this single plane or section may be covered by the term "continuity." This thought involves quite different conceptions from those involved in the term "uniformity," meaning uniformity of a property belonging to a large group of particles. The microscope has shown us that our steels are always more or less discontinuous and that the distribution of these sonims of other planes of weakness may have extremely serious consequences. Larger disturbances such as blow-holes, seams, segregations and piping become so apparent as to even affect the uniformity of the mass itself rather than merely the continuity from element to element of the material.

Testing Continuity Magnetically

Much work has been done on magnetic methods of testing continuity. In most of these cases we are really testing the uniformity of smaller and smaller volumes of metal in the expectation that the discontinuity on a single plane will be sufficiently marked to detect. As might be expected,

however, the smaller the area involved the greater becomes the difficulty in measurement as well as the variation from section to section both mechanically and magnetically. Neither side of the problem is complete. It is the latter difficulty which makes the development of magnetic methods so exceedingly slow and laborious in practice, although apparently so simple and straightforward in the laboratory.

Materials in use usually fail from impact, repeated impact, fatigue and wear. Failure from corrosion is obviously not included. Our mechanical methods of test for all of these, particularly fatigue, are inconceivably slow and crude; and in the case of wear there does not appear to be even the hope of a definition of this property, and yet the successful magnetic test must be capable of mechanical interpretation.

In spite of these difficulties magnetic methods frequently offer a simple method of assurance that a particular product is substantially uniform throughout its length, is without major discontinuities, and has the average mechanical properties of other specimens which have been studied to destruction.

Efficiency of Industrial Electric Furnace

AT a recent meeting of the fuel division of the American Society of Mechanical Engineers, held in Cleveland, James H. Herron of the James H. Herron Co., engineer, delivered a paper on "Industrial Furnace Efficiency, Economic Consideration." The paper dealt with the subject in a general way and discussed loss of heat in waste gases, regeneration, recuperation and certain other phases of the subject. The part of the paper dealing with electric furnaces was of special interest and is reproduced here.

Owing to the increased interest in the use of electricity in supplying heat for industrial purposes, this paper would not be complete without some reference to such furnaces for heat-treating and other industrial purposes, together with a consideration of their efficiencies.

Electric furnaces have been used for laboratory work for 20 years or more. The early furnaces were of the muffle type, the heating element being of platinum ribbon wound upon the muffle. With the introduction of the nickel-chromium alloys, either a nickel-chromium wire or ribbon was used as a substitute for the platinum.

Granular Carbon Resistances

The early industrial furnaces utilized the resistance offered by a quantity of granular carbon, usually contained in a refractory trough. These furnaces, while expensive both in construction cost and operation, became, due to their greater efficiency of operation, popular not only in the heat-treating of materials, but in the annealing of steel castings and the melting of non-ferrous metals.

Applying the laboratory form of resistor to the industrial furnace, and improving this resistor, has resulted in a comparatively low cost, high-efficiency, electric furnace which is rapidly succeeding the granular carbon resistor type, until at the present time the application of electric heating in industrial furnaces has become a matter of such general interest that, in all cases where current is available at a reasonable figure, such installation should be seriously considered.

Factors Affecting Economy of Operation

As in the fuel-fired furnace there are certain factors which affect the economy of operation of the electric furnace and therefore must be taken into consideration. These are as follows:

The loss of heat around door openings and loss due to

opening doors for charging and removal of materials to be heated.

The loss of heat through the sides, ends, top and bottom of the furnace with subsequent radiation from these surfaces.

The storage of unavailable heat.

The principal source of loss common to the fuel-fired furnace, namely, the loss of heat in the waste gases, is entirely eliminated in the electric furnace. In the electric furnace there is no air required for combustion, therefore there is no need of introducing into the furnace a large amount of air which must be heated to the temperature of the furnace and discharged at a high temperature.

In view of this one item, and the loss due to excess air used for combustion the cost of operation of the electric furnace compares very favorable with the fuel-fired furnace, and in some cases this cost is less. This is especially true where it is possible by use of an electric furnace to correct a low power factor. The saving in penalty may offset the cost of the required current.

Efficiencies Vary Between 60 and 80 Per Cent

The nicety of regulation of the electric furnace and the cleanliness of operation appeal to many and these are points decidedly in its favor. In considering the electric furnace, the efficiency will vary between 60 and 80 per cent, depending on the conditions of operation. The gross efficiency extending back through the generating station may be, and frequently is, as high as the fuel-fired furnace. The electric furnace has the same drawback as the fuel-fired furnace where the operation is intermittent, namely, the heat required to bring the furnace to the required temperature of operation known as unavailable heat.

In view of the progress made in such design it is therefore desirable for the prospective purchaser of an industrial furnace to give careful consideration to the electric furnace, since it may be the most economical for his particular application.

Merchants' Association Year Book

Classification of the membership of the Merchants' Association of New York is made in the Year Book for 1928. More than 6300 individuals, firms and corporations are listed, about 1000 of which have their plants elsewhere than in New York. The membership includes 186 concerns listed under the heading of Iron and Steel, Metals, Machinery. This is the eighth largest of the classifications.

Some Principles of Fixture Design

Fixtures for Machining Should Be Tied in with Gaging System—
Many Details Can Be Standardized

BY JOSEPH W. ROE*

JIGS and fixtures have been developed empirically and there is much less technical literature covering them than there is on power machinery and its utilization, or even on the very machines on which fixtures are used. Judging only from the literature available, one would gain no idea of their economic importance. However, the competitive technical advantage of one manufacturing plant over another will usually lie more in the better quality of its small tools, jigs, and fixtures than in differences between the types of machine tools in the respective plants.

The principles of good work-holder practice have grown up in the tool rooms and been handed down from man to man. Due to the multiplicity and variety of articles manufactured, there is a great diversity of fixtures and holding devices, so great as to preclude treatment of all their details in a paper such as this. But through all fixtures there run certain principles which have been developed gradually and come to be recognized as good practice. Many of these principles can be brought together, and it is the purpose of this paper to do this.

Before a set of fixtures can be designed the dimensions of the article to be manufactured must be definitely determined. This means that clearances and allowances must be made on certain dimensions for running, sliding, or driving fits. Furthermore the tolerances, or permissible deviations, must be established. These tolerances set the high and low limits for each dimension, which can not be exceeded without encroaching on the allowances necessary for proper functioning or destroying the interchangeability of the parts. In general the smaller the tolerances the greater the cost of production, consequently they should be as liberal as is consistent with the requirements of the product, and accuracy should be centered on those dimensions on which it is essential. The closeness of the tolerances governs the design and workmanship of the jig or fixture quite as much as the required rate of production.

When the drawings of the article to be manufactured have been checked and approved, a model should be made to within the tolerances given on the drawings. When this has been tested and pronounced satisfactory, any changes found necessary in allowances, tolerances, etc., should be incorporated into the drawings. The model and drawings can then be used as the basis for design of the jigs and fixtures. If during the building of the tools any discrepancy should develop between the model and the drawings, the approved working model should govern, and the drawings corrected to agree with it. When actual model parts are not available, wooden models of such parts as drop-forgings, with the location of the sprue and flash line painted on them, may be helpful.

Production and Gaging Operations Should Be Listed

In tooling up for the manufacture of a piece, an operation sheet should be prepared which includes every operation on the piece, both of production and of inspection or

gaging, showing them in a single list in the order of their application. The preparation of such a list focuses attention not only on the best sequence of production operations, but on the number of inspections needed, the dimensions they should cover, and the best points in the sequence at which they should occur. It also brings out the best grouping of operations and their reduction to the least possible number.

An authority consulted contributes the following as the procedure used by one large manufacturer having agencies throughout the world: "When a new machine has been developed to a stage where it functions satisfactorily the agencies are informed, and inquiries are instituted to determine the probable sales for the machine. During this inquiry period the machine is going through a process of refinement. Drop-forgings, stampings, grades of metal, hardness and finishes are being determined. When the approximate yearly sales have been determined manufacture starts by ordering all drop-forgings, blanking and bending dies, as these take the longest time to construct. Parts which are odd in shape or difficult to hold are assigned for tooling up, starting in the usual manner, with operation sheets which are provisional, as it is often necessary to revise the sequence of operations. Quality and interchangeability are the main requirements. While quantity will influence the type of fixtures it is possible to make cheaper tools at first with provision for the future if unexpected sales should develop."

The fixtures should be tied in with the system of gaging. The same points or surfaces should be used for locating the work in the fixtures and for reference points in the gages. Only by so doing are the gages a direct check on the fixtures. Some deviation is made, however, as when inspection gages are made to cover a sub-assembly of parts in order to insure that certain collective deviations do not exceed permissible tolerances. In some cases, also, as with pistons, it may be desirable to provide lugs especially for holding and driving during manufacture, which are removed in the last operation.

The same working points should be used on the two parts which go together in the manufactured output. This better insures interchangeability of the finished product.

In selecting the working points the functioning of the product and those dimensions which are most important to its operation should be given most careful thought.

Same Working Points Used for Many Operations and Gagings

It is of fundamental importance that, once settled upon, the same working or locating points be used for as many operations and gagings as possible. Preferably they should be permanent and remain in the piece when finished. If this cannot be done they should be retained as long as may be. If first one point and then another be used, an accumulation of errors creeps in which may exceed the tolerances. It is tempting at times to shift the locating point, as the fixture and gage might then be made more cheaply, but to do so is poor practice, and in the long run, poor economy. As an example of the above, in a set of fixtures recently built for a military rifle, 62 out of 67 operations on one piece, with their gagings, were located from one point.

It may be wise to shift the reference point, but it should be done only for good and sufficient reasons. For instance, the position of two holes *A* may be referred to a main reference point. The important requirement of a second hole *B* may be exact distance from holes *A* without regard to the

*Professor of industrial engineering, New York University. From a paper on "Jig and Fixture Practice," presented by Professor Roe before the American Society of Mechanical Engineers at New York, Dec. 3. Formulas for determining the probable profit on proposed jigs and fixtures, for given costs and performance, also a feature of the paper, were given in THE IRON AGE of Dec. 13, page 1489.

original reference point. In such case both the fixture and the gage would very properly locate *B* with reference to the holes *A*.

If a multiple fixture is to be used, of either the reciprocating or indexing type, the question of the time required for removing and inserting pieces is of fundamental importance, as the clamping means must be so designed that the pieces can be handled in the time taken for the cut.

In general it is desirable to machine as many surfaces, or drill as many holes, as possible at one setting. This makes for accuracy, lessens tool expense, and cheapens production, but is subject to some limitations, as, for instance, the combination of a very large and very small hole in the same jig. It may be better to use two jigs on different sized machines. In some cases all the holes can be drilled in the same jig on one machine, and the larger holes then redrilled on another machine without a jig. This eliminates the cost of one jig.

In using a fixture equipped so that several tools perform the same operation on several pieces simultaneously, the parts from each tool should be kept separate. By so doing if the product from one tool is defective, the parts will not become mixed and the trouble is more easily located and remedied. However, the additional cost of handling the parts separately may sometimes more than offset the advantages of easily locating trouble.

How far it is desirable to make a fixture adaptable to various pieces and operations is a matter of judgment in each case. It usually does not pay except where the runs are very small. In general specialization is better than adaptability, because the latter, while it lessens tool expense, permits errors in settings and "monkeying" with the set-up.

Fixtures Should Be Interchangeable on Various Machines

Fixtures should be interchangeable on the various machine tools on which they can be used. Care in this particular allows greater flexibility in scheduling work through the shop. This principle calls for the standardization of slots on milling machines, machine tables, and of keys and keyways on the fixtures. So far as possible these should conform to the standards adopted by the American Engineering Standards Committee, and sponsored by such bodies as the A.S.M.E., the National Machine Tool Builders' Association, and others.

All jigs and fixtures should be clearly marked, preferably by stamping into the body where it can be done, the

operation, part number, etc., for which it is intended and any other information needed to identify it, also on all loose or bolted parts that may be separated from it. In very accurate fixtures stamping might be harmful. In such cases a brass plate should be screwed on, or the necessary marking may be etched.

All small parts, such as clamps, special wrenches, etc., should preferably be permanently attached to the jig or fixture to prevent their being mislaid or lost.

Despite the wide variety in jigs and fixtures many details may be standardized such as bushings, latches, handles, thumb-screws, etc. This lowers costs not only by making approach to quantity production possible in the tool room, but by making it possible to purchase them from firms specializing in such parts. It is amazing in going through large tool storages to see how many types of handles, etc., there are, differing from each other in unessential details in ways which run up costs without any compensating benefit.

The object of good fixtures is furthered by good work holders or racks for handling the work between operations. Throwing work promiscuously into tote boxes mars the finished surfaces and may cause misalignment in locating in succeeding operations.

Nine Things a Jig or Fixture Should Do

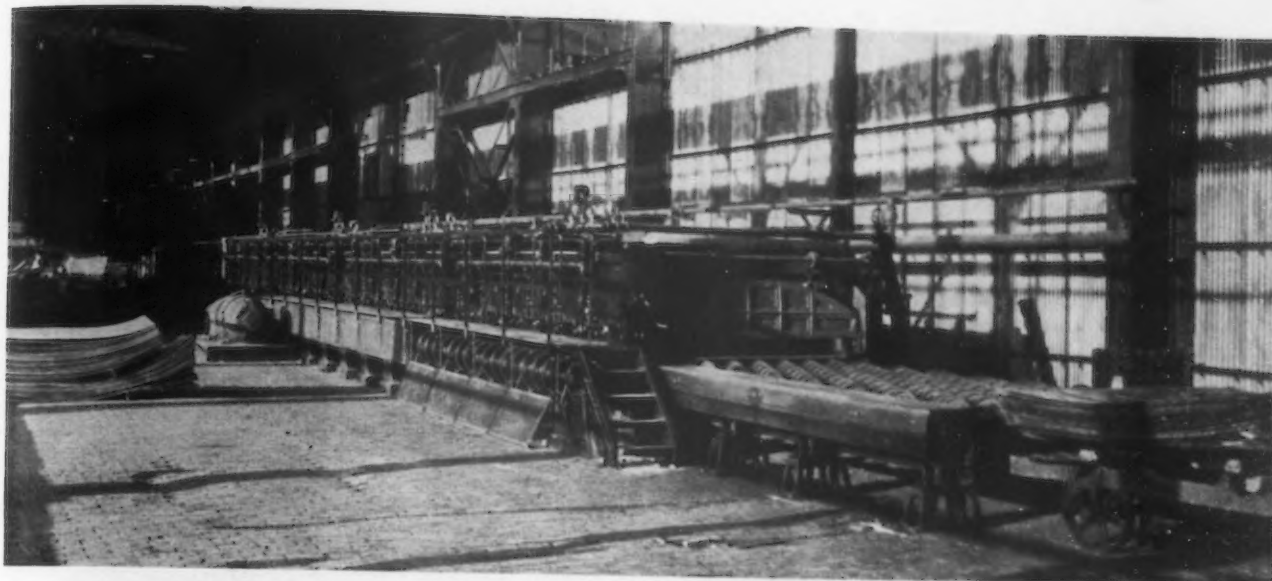
A jig or fixture should:

- (a) Locate the work quickly and positively
- (b) Preclude insertion of the work in any but the position correct for cutting
- (c) Provide rapid and positive clamping without undue effort
- (d) Allow no spring in the work, fixture, or machine table from either clamping or the pressure of the cutting tools
- (e) Allow no slipping, vibration, or chatter during the cut
- (f) Have ample clearance for chips, and be easily cleaned
- (g) Allow free access and egress for cutting oil or compounds
- (h) Be as light as is consistent with strength and rigidity, and easy to handle. In the long run the employer always pays for weariness, necessary and unnecessary. It is good design therefore to eliminate all unnecessary fatigue
- (i) Be safe for the operator. Production should be sacrificed, if necessary, rather than have a tool which is dangerous.



Houses a Works' Hospital, Library, Auditorium and Recreation Facilities

THE new service building of the Yale & Towne Mfg. Co., Stamford, Conn., which was recently dedicated, was provided for through a special bequest in the will of the late Henry R. Towne, for many years chairman of the board of the company. The building houses a works' hospital, dental clinic, the company's industrial relations bureau, a library and an auditorium seating 400. Bowling alley, pool room and other recreational facilities for employees of the company are included.



Very Large Normalizing Furnace, for Steel Sheets, Installed by Otis Steel Co.

★ Sheets Normalized on a Large Scale

**Continuous Furnace for Wide Automobile Body Sheets—
Heating and Cooling Stages Automatically Regulated**

CONTINUOUS normalizing furnaces have been installed in a number of sheet mills making full finished sheets during the past few years. The object is to produce a finer grain structure and to improve the drawing qualities. A late type of normalizing furnace, and one of the largest ever built, was recently placed in operation by the Otis Steel Co., Cleveland. It is used to normalize extra deep-drawing automobile body sheets. It was built by the Surface Combustion Co., Toledo, Ohio.

This is a natural gas-fired furnace, 140 ft. long including loading and unloading tables, and has a heating chamber 100 ft. in length and a cooling chamber 40 ft. long. It is 84 in. wide or sufficient to handle sheets 80 in. in width. The furnace has a capacity of 140 tons in 24 hr., but it has been decided to augment this by replacing the present burners with larger ones increasing the heat, so that the sheets can be moved through the furnace at a faster rate. With the larger burners the capacity will be 200 tons in 24 hr.

The furnace is top and bottom-fired, having 60 burners at the top and 60 at the bottom in the heating zone. The burners are located on each side. The sheets are carried through the furnace on roller disks mounted on hollow water-cooled shafts that are insulated with high heat-resisting alloys. There are also burners on each side of the cooling zone for use when slow cooling is desired. Usually the sheets are made with a Rockwell hardness of 51 to 52. If quick cooling of the product is desired to increase the hardness and secure a fine grain, the cooling zone burners are not lighted, but if a lower hardness is desired the burners in the cooling zone are lighted to bring up the tem-

perature of that zone and thus to secure a less rapid cooling. A temperature of 1700 deg. to 1750 deg. Fahr. is maintained in the heating zone to assure a 1650 deg. temperature of the product when annealing low-carbon steel.

The temperature in the heating zone is controlled by four pyrometers. In addition to pyrometric temperature control, there are two ardometers, or radiation type pyrometers, located between the heating and cooling zone that record the temperature of the sheets as they leave the heating zone. The minimum temperature of the sheets to effect proper normalizing should be 1650 deg. Fahr. and the

ardometer readings indicate to the operator whether the sheets move through the furnace too rapidly or too slowly to maintain them at the proper temperature. The heating period depends on the gage of the sheets, light material moving through the furnace at a faster speed than the heavier gages. The temperature is controlled by regulating the speed of the roller disks.

Before the normalizing furnace was installed the extra deep drawing automobile sheets were given two box annealing operations each of 30 hr. With the use of the normalizing furnace they are given only one box anneal after normalizing, the annealing period being 48 to 50 hr. The sequence of operations is normalizing, pickling, cold rolling, box annealing, then one pass through the cold rolls to relieve the surface strains and finally roller leveling.

Johns-Manville Corporation Buys Celite Products Co.

The Johns-Manville Corporation, 292 Madison Avenue, New York, manufacturer of roofing materials, has purchased the Celite Products Co., Los Angeles, maker of insulating materials. The executive and sales personnel of the Celite have been absorbed by the Johns-Manville organization.

Studies the Elements of Metal Cutting

Prof. O. W. Boston, head of the engineering shops of the University of Michigan, at Ann Arbor, is the author of a bulletin entitled "The Elements of Metal Cutting," published recently by the university's Department of Engineering Research. With the help of funds contributed by manufacturers in the Detroit area, Professor Boston has been making a

series of studies in the ancient art of cutting and forming metals.

Milling cutter action, drilling and straight line motion, such as that of the planer, have been the subject of Professor Boston's investigations thus far. Part of the research has been directed toward a study of the varying hardness of the cutting tools used, which include a plain, high carbon steel, high-speed steel and "Stellite." These studies will be given a wider scope and usefulness as soon as the funds available warrant greater expenditure.

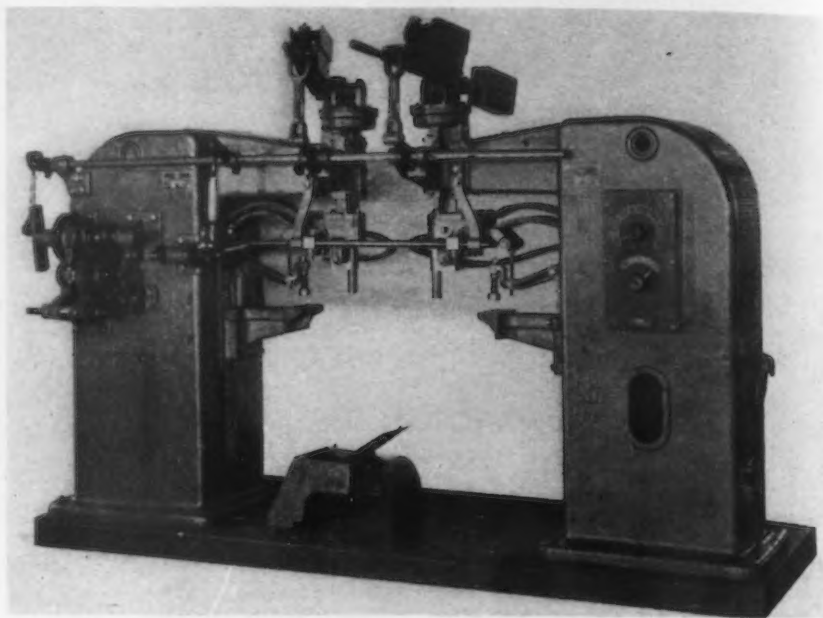
The Federal Specifications Board, Washington, last week issued proposed specifications for aluminum-manganese tubes with a view to obtaining comments or suggestions as to changes which may be thought to be desirable. The specifications are the basis for purchases by the various departments and establishments of the Government.

Two Special Electric Welding Machines

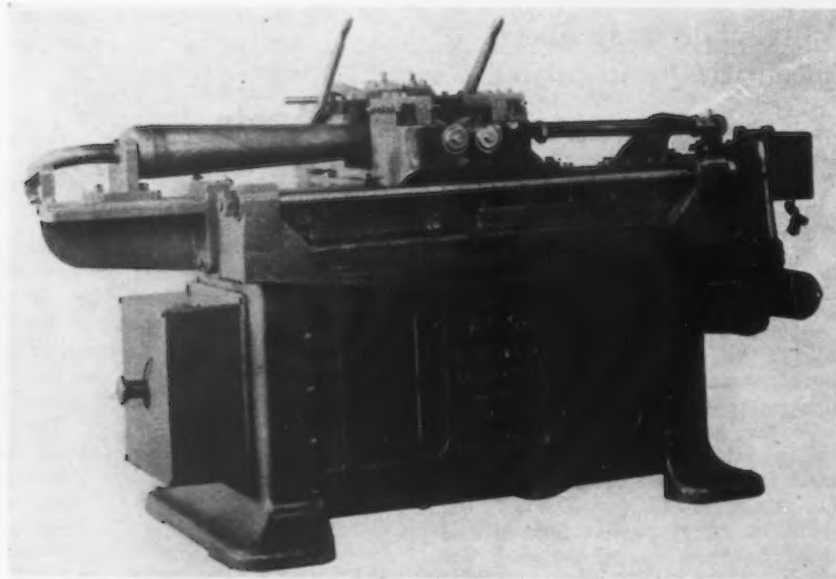
TWO special welding machines, one a butt welder for use in the fabrication of automobile mufflers and the other a spot welder that makes two rows of spot welds in metal door assemblies simultaneously, are shown in the accompanying illustrations.

Automobile mufflers of various wall thicknesses are welded by the butt welding machine, which is the product of the Taylor-Winfield Corporation, Warren, Ohio, and is designated as the type B II special. The machine is motor operated. Timing of the current and upsetting of the weld are accomplished by adjustable cams. Uniformly accurate welds with minimum of labor expense is claimed. The particular machine illustrated welds the heads of the muffler to the body and the intake and outlet tubes to the head, making a completely electric-welded muffler.

The special spot welding machine, built by the Thomson Electric Weld-



The Thomson Welder, Which Makes Two Rows of Spot Welds Simultaneously, Is Shown Above



Automobile Mufflers Are Welded on the Taylor-Winfield Butt Welder at the Left

ing Co., Lynn, Mass., is made up of two standard welding machines mounted face to face on a sub-base that is adjustable to accommodate work of various widths between the electrodes. One driving motor operates both machines and the welds are made at the rate of 100 a minute.

Auxiliary Indexing Tables for P. & W. Jig Borers

TWO new indexing tables, one of tilting rotary type, have been brought out by the Pratt & Whitney Co., Hartford, Conn., for use on its jig boring machines.

The tilting rotary table is used to advantage in boring holes that must be accurately spaced and accurately located at an angle, and is said to save considerable time and simplify many difficult jobs. It has a scraped

surface 12 in. in diameter and is designed for clamping to the regular table of the machine. The rotary part of this table is similar to the rotary table which has been a standard jig borer accessory for some time. The outer edge is graduated in degrees

for approximate indexing, which is accomplished by means of a large handwheel through a hardened and ground steel worm and large worm-wheel. The latter is integral with the cast-iron table and is cut by a special process to assure high accu-



The Tilting Rotary Table, at Right, Clamps to the Regular Table of the Jig Borer. The rotary indexing table at the left has 30-in. diameter working surface and is equipped with motor drive



racy. One revolution of the hand-wheel rotates the table 9 deg. Exact settings are made by a small slow-motion handwheel which connects through gearing to the same shaft as the large handwheel. The large dial on the small shaft is subdivided so that the table may be indexed accurately to 5 sec. Binders lock the table in position during the boring operation.

The table is hinged at one side and is raised and lowered by means of a crank handle through a worm and a gear segment. Graduations facilitate setting the table at any angle with the horizontal from 0 to 90 deg. and a vernier permits settings to 5 sec. Heavy binders are provided for

clamping the table securely in place.

The second table, also illustrated, is a rotary indexing table, which, with a working surface 30 in. in diameter, is much larger than previously supplied for the company's No. 2 jig borer. The outer edge is graduated in degrees for rough setting, finer settings being made by means of a handwheel and a vernier. An added feature is a small motor drive by means of which the table may be moved rapidly under power, thereby saving cranking by the operator. This motor drive can be operated in either direction and is controlled by a convenient lever. An adapter plate is used to mount the large rotary table on regular table of the jig borer.

Steel Roof Sheathing for Factory Use

LIGHT-WEIGHT steel sheathing for roofs is being put out by the Blaw-Knox Co., Pittsburgh, under the trade name of Blawsteel. It consists, as the

This sheathing when installed can be insulated against heat loss or penetration to any degree desired. It is said that $\frac{1}{2}$ in. of insulated material

Illustrating the Placing of Galvanized Steel Roof Sheathing, Its Insulation and Final Weatherproof Covering

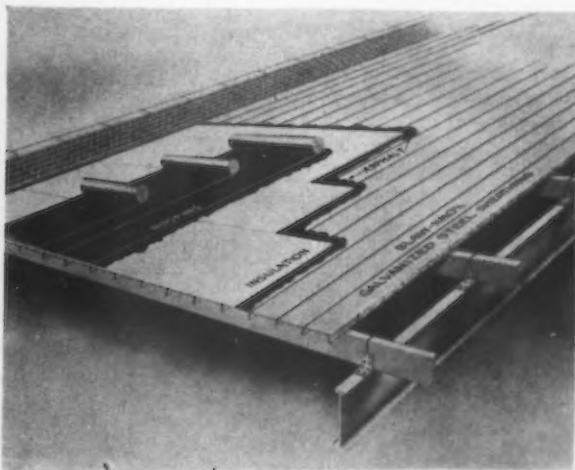


illustration shows, of ribbed, galvanized steel sheets of 20, 22 and 24-gage material. This is designed to go over purlins spaced 3 ft. 10 $\frac{1}{2}$ in., and will, it is said, carry a roof load of 65 lb. to the sq. ft. on this spacing, with a factor of safety of 4 and with so little deflection as not to affect plaster ceilings. Deflection of 3/16 in. is said to result from loading of 100 lb. to the sq. ft.

will satisfy usual requirements. Any type of built-up roofing can be applied on top of the insulation.

Longitudinal integral reinforcing ribs are pressed into the sheathing on 4-in. centers. These ribs are placed downward when the roof is built, and the sheets are fastened to the purlins by special anchors. Each course of sheets laps 3 in. over the preceding course, the ribs telescoping.

American Radiator to Merge With Standard Sanitary

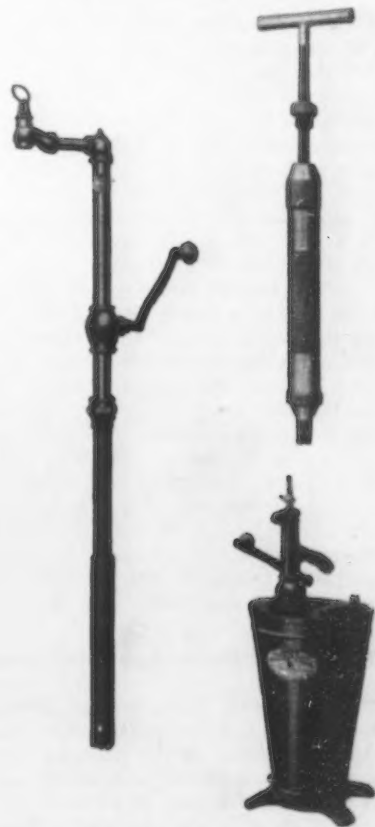
Negotiations are under way for a merger of the American Radiator Co., 40 West Fortieth Street, New York, the country's largest maker of radiators and heating equipment, and the Standard Sanitary Mfg. Co., Bessemer Building, Pittsburgh, the leading producer of enameled iron sanitary ware and plumbing equipment. Merger plans call for an exchange of stock in the two companies, the details of which have not yet been worked out, and it is probable that

the organizations of the companies will remain unchanged.

The Radiator company operates more than 30 plants in the United States and subsidiaries in Canada and in a number of European countries. Its most recent acquisitions have been the Kewanee Boiler Co., Kewanee, Ill., and the American Blower Co., Detroit. The Standard Sanitary company operates eight plants in this country, and through its subsidiary, the Standard Sanitary Mfg. Co. of Canada, Ltd., two Canadian plants. Combined assets will amount to about \$500,000,000.

Hand-Operated Lubricating Device

THE Dot Lubricating Equipment Co., Division Carr Fastener Co., Cambridge, Mass., is offering the improved Nozzle-Fil lubricating equipment illustrated, which, in providing a "sealed journey from lubricant storage to bearing," permits the proper quantity of clean grease to be pressed into bearings to be lubricated. A barrel pump, portable filling tank and a hand gun comprise the equipment. The portable tank, which holds 25 lb. of grease, is filled in the lubricant



Grease in the Portable Tank Is Applied to Bearings by Means of the Hand Gun

storage room by means of the barrel pump. This tank is airtight and dust-proof and is shaped so that it may be carried without barking the shins of the greaser. In filling the hand gun the plunger in the gun is first released by loosening a locknut. After the nozzle is applied to the nipple on the portable tank, the gun is hand-pumped full of grease, which is accomplished in a few seconds.

The filled gun is then applied to Dot nipples or Dot-O-Matic pressure cups on the bearings of the machine to be lubricated and the handle of the gun twisted until the bearing flushes or the telltale at the top of the pressure cup reaches its extreme height.

The Climax Molybdenum Co., New York, has removed its Detroit office from 611 Donovan Building to 2807 Book Tower Building. W. P. Woodside is district representative.

Steel Demand Shows Seasonal Decline

Large Volume of Consumption Is Nevertheless Indicated—There Have Been Few Signs of Overproduction of Steel

BY DR. LEWIS H. HANEY

DIRECTOR, NEW YORK UNIVERSITY BUREAU OF BUSINESS RESEARCH

STUDY of the potential steel requirements of the chief consuming industries shows that until November they continued at record levels for the post-war period. Such requirements amply support the recent high rate of steel ingot production. No overproduction is indicated. If anything, the output of steel until November was hardly up to the indicated current requirements.

In November, however, all indications showed a rather sharp decline in our composite demand line. The statistics are not complete as yet, but they indicate the sharpest drop that has occurred since December, 1926, at least. Fortunately the rate of steel production moderated in November also, so that the output is still in line with requirements. But the November decline, both in the activity of consuming industries and in steel production, suggests the possibility of some further recession.

November Recession Indicated

COMPOSITE steel demand showed a slight rise in October, due chiefly to gains in the railroad, construction and mining industries, and in exports. Drilling of oil wells and production of oil also increased. These factors were not quite offset by declines in automobile production, general manufacturing activity and farm purchasing power.

The situation changed considerably in November. In that month railroad freight traffic showed a decline that was fully up to the usual seasonal drop. Building and construction contracts were off rather sharply, falling back to about the same annual rate as in July. Automobile production reached the lowest annual rate since last January. The data are incomplete, but the factors mentioned are so important that the November final index will doubtless approximate that shown in the first chart.

It should be noted that October had about 4 per cent extra working time this year. This probably makes the October index a little too high, which in turn emphasizes unduly the decline shown for November. Probably the chart would give a more correct picture if the composite demand line were portrayed as rounding off in October, with a more moderate decline in November—somewhat similar to

the movement shown in the steel production curve.

Conditions in Particular Lines

As to the outlook for the next month or two, we find the *railroads* showing improvement. Net operating income in October made a good gain. Freight traffic increased considerably in that month and, considering the season, the November traffic was well sustained, promising a good gross for the month. If expenditures continue as low as in recent months, net income should make a good showing. It must be remembered, however, that the decline in expenses is partly the result of economy in buying. Purchases of rails have been below last year and, while demand for equipment has improved somewhat, it is none too good. In short, the outlook is for some improvement, but only a fair volume of railroad buying.

Building contracts are still large, being sustained by the construction of roads and subways, which, while they require considerable steel, are not indicative of the ordinary commercial building trend. In fact, building permits continue their downward trend and in November were about 16 per cent under a year ago. Contemplated new construction increased sharply, but this was largely due to a \$100,000,000 project for roads in Iowa. On the whole, the building outlook suggests further declines, which should affect certain kinds of pipe, nails, sanitary enameled ware, etc.

Automobile production fell off more than usual for the season last month, and the future seems uncertain. The industry is set for a heavy production schedule in the early part of 1929. High activity is probable. Many, however, look for increased severity of competition and less favorable conditions after the usual spring spurt.

General manufacturing activity (aside from automobile and iron and steel) has shown a decline. No large recession, however, is indicated, though it seems probable that the peak has been passed. Farm purchasing power appears to be not much different from a year ago. The value of the chief crops is about 6 per cent under last year, but dairy products show a large increase.

We conclude that the demand for steel has reached a peak and that a

little recession is likely. It may well be that a short spurt will occur early next year, but this would probably be followed by a decline. The trend of the P-V line has been downward for two months.

Freight Cars More Freely Bought

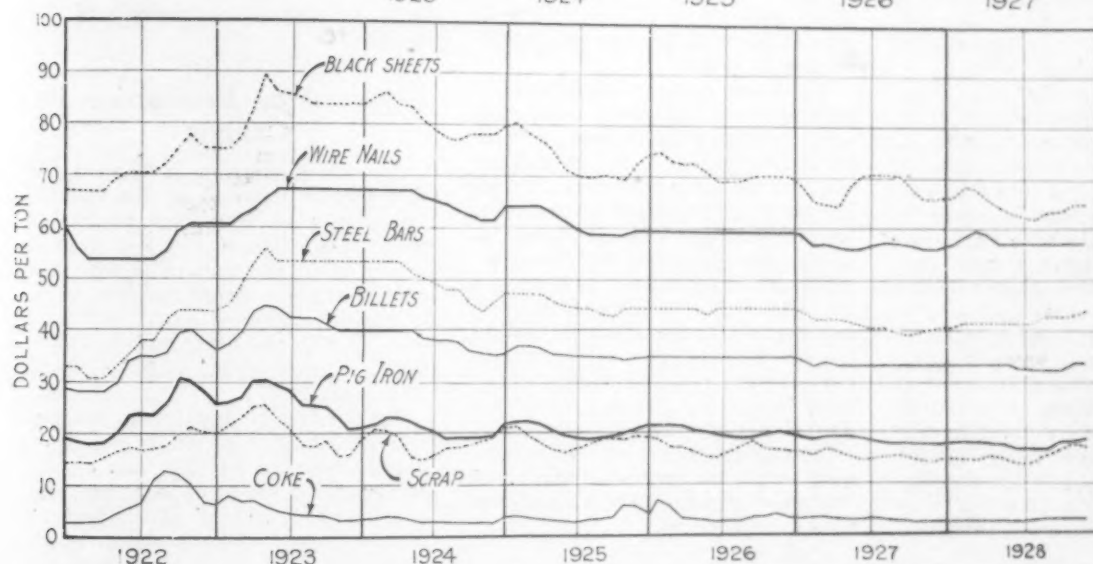
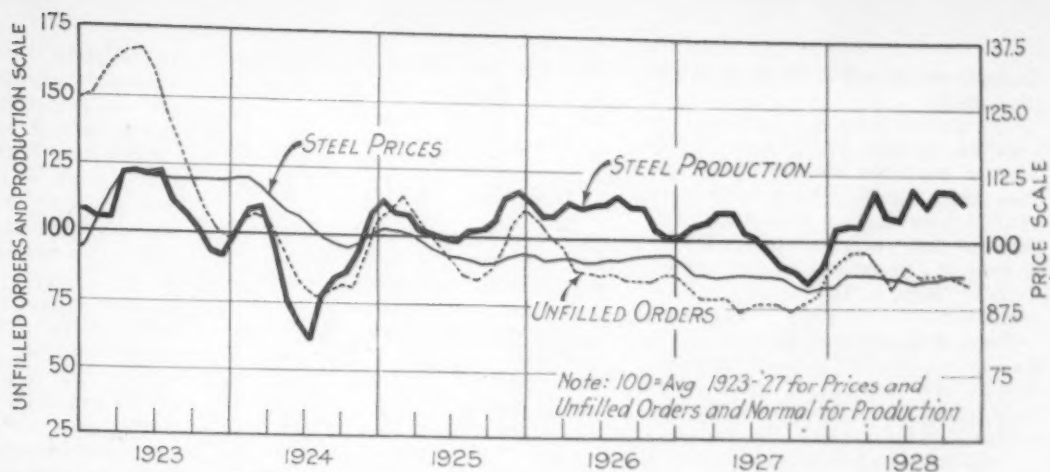
A CONSIDERABLE increase has occurred in the purchase of railroad freight cars and a good-sized volume of inquiries is reported. Briefly, the facts as to equipment buying are as follows: In November, 6100 freight cars were ordered, which is the largest November business since 1925. The freight car surplus of the railroads is small in comparison with a year ago. Freight traffic in November was heavier than in any recent year except 1926. A moderate improvement in freight car buying is thus indicated. It is noteworthy that employment in railroad equipment repair shops in the East increased sharply in November and was above a year ago.

There has, however, been little change in the locomotive business. Only 41 steam locomotives were ordered by domestic railroads in November and no upward trend is evident. Total shipments of steam and electric locomotives declined in November, and unfilled orders were lower. This indicates a decrease in new orders. The business during the last four months has been at the lowest level since 1921-1922.

Moderate Recession in Ingot Production

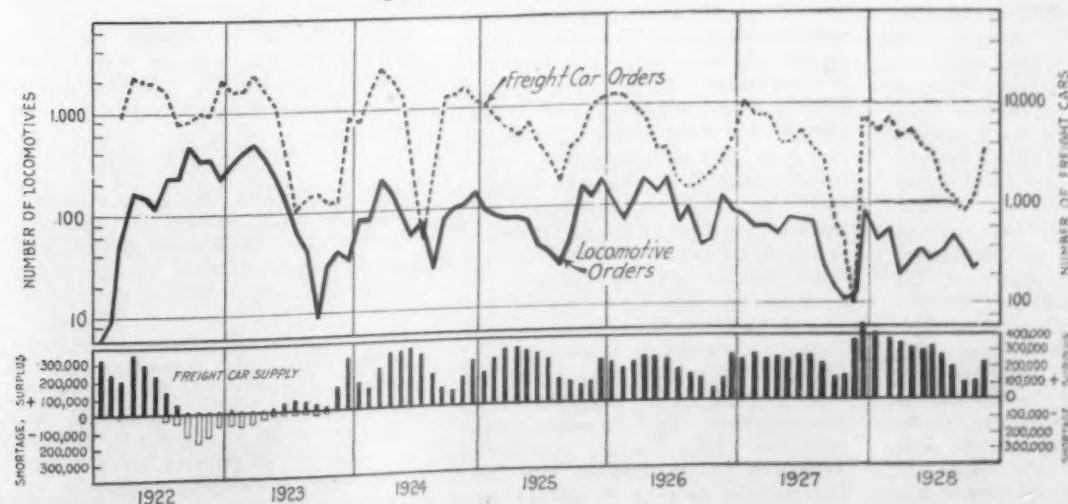
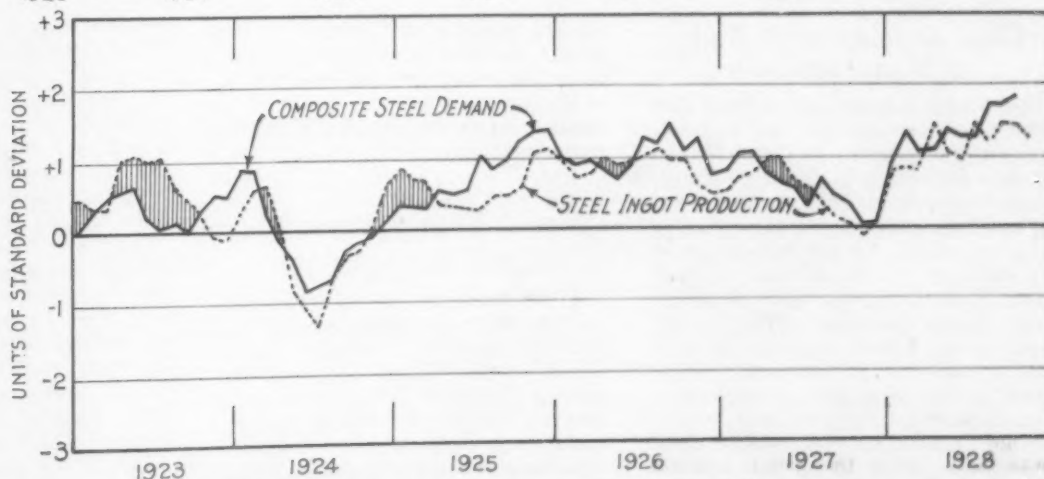
AVERAGE daily production of steel ingots (adjusted to eliminate seasonal changes), after rounding off in October, declined in November. Our index for the month is 114.6. This means that steel production was 14.6 per cent above normal. The index in October was 118.8 and a year ago 85.1. The year's peak of 119.2 was reached in September. This is beginning to look like a cyclical peak. Steel production has recently been far above a normal level, and declines in the P-V line and in the composite demand line indicate further moderate recession. At least, the seasonal increase that usually occurs between

Steel Production in November Was 14.6 Per Cent Above Normal Requirements. Prices held well but little further advance is probable. Unfilled orders showed a decline instead of the usual November rise



Improved Finished Steel Prices (in Particular, Sheets and Bars) May Hold for Some Time. Scrap prices appear to be ready for further decline and pig iron should hold present levels for a month or two

Steel Ingot Production (Adjusted) Showed a Decline in November. Composite demand showed a slight rise in October, but November indicates a falling off



Railroad Car Orders Are Improving, While Locomotive Orders Continue Low. But the surplus of cars is so large that there is no indication of immediate need for heavy purchases

January and March is likely to be less than usual.

The unfilled orders of the Steel Corporation declined 78,000 tons in November and were 700,000 tons lower than last March. They were only 220,000 tons above a year ago. Except for last year, this is the lowest November figure in many years. Usually there is an increase in November.

The average price of finished steel in November showed a small increase. It was 93.8 per cent of the average for 1923-1927, compared with 97.2 per cent in November, 1926. The situation in some respects resembles that found in the latter part of 1926. It does not seem that much further advance in steel prices is probable.

Overproduction of pig iron is in sight. The November average daily output was 115.5 per cent of normal, compared with steel production at 114.6. This is the first time that pig iron production has been in excess of a normal relationship with steel production since December a year ago. At that time both were at low levels, while now both are above normal. Pig iron production is at a level which in the past has always brought price weakness in a short time.

Pig iron prices, however, averaged higher in November, THE IRON AGE index for the month being \$18.49, which is 86.4 per cent of the average for 1923-1927, against 84 per cent in October and 82.3 per cent a year ago.

Ohio Employment High in Manufacturing

Industrial employment in Ohio during November showed the first decline since January, according to the current bulletin of the Bureau of Business Research of Ohio State University. The decrease, however, was caused entirely by the falling off of 25 per cent in construction employment, whereas general manufacturing employment increased slightly. The number of industrial wage earners last month was 12 per cent greater than in November, 1927, and average employment during the first 11 months of 1928 was 1 per cent greater than during the same period last year.

In the iron and steel group, the November employment index of 102 was the same as in October, but was 17 per cent higher than in November, 1927. Of the 171 reporting companies, 75 showed increases from October, 85 decreases and 11 no change. Employment in the machinery industries of Ohio continued its upward climb during November and reached its highest point since December, 1926. The November index of 113 was 3 per cent greater than the October index and 11 per cent greater than the November, 1927, index. The improvement in the machine tool group is notable, the November index of 120 being 4 per cent above the October index and 48 per cent above the November, 1927, index. In the material handling and power ma-

The situation bears some resemblance to that found in January, 1926. A decline in prices within the next month or two is indicated.

Prices Not Far Out of Line

AS to the general price structure in the iron and steel industry, it may be said that sheets are low, while nails, bars, billets and pig iron are in fairly good adjustment. If anything, the steel items are a little high in comparison with pig iron, though not much. Heavy melting steel scrap is high, especially in comparison with pig iron. The average of finished steel prices appears to be about right in comparison with the general level of commodity prices.

We might reason that sheets and nails will hold their recent gains, that scrap (following the current tightness at Pittsburgh) will decline further, and that the other chief items, including pig iron, should hold about stable. Our pig iron barometers, however, indicate that the prices of this commodity will soon reach a peak and are likely to decline. The clearest indication given by the statistics is that there will be an early end to the advance in the pig iron market. The scrap barometer, also, has not yet indicated any sustained recovery.

Perhaps this tangle of factors suggests what the market writers call "irregular stability" for a time—certainly, irregularity.

chinery group, the November index of 107 reflected no change from October, but was 25 per cent above that in the corresponding month last year. In all cases an average month of 1923 represents 100.

Would Extend Powers of Tariff Commission

A subcommittee of the National Conference on Tariff Adjustment has been appointed to draw up a plan to "take politics out of the tariff" by making the Tariff Commission a more practical and helpful adjunct of Congress. This body of men will confer with members of the House Ways and Means Committee, President Coolidge and President-elect Hoover and others specifically interested. The names of the members of the subcommittee have been announced by John E. Edgerton, president of the National Association of Manufacturers, under whose auspices the National Conference on Tariff Adjustment was brought together. Among them are James A. Campbell, president Youngstown Sheet & Tube Co., Youngstown; J. W. Hook, president Geometric Tool Co., Bridgeport, Conn., and W. W. Nichols, assistant to president, Allis-Chalmers Mfg. Co., Milwaukee, Wis.

In explaining the purposes of the subcommittee Mr. Edgerton states that the national conference favors extending the powers of the Tariff Commission so that it will be more

immediately operative in meeting contingencies, making it a semi-judicial and non-partisan body. Adequate appropriations for research and fact-finding would be necessary, and actual powers of rate adjustment (not rate making) would make it a more practical working adjunct of Congress. It is not intended, he explained, to ask Congress to abrogate or relinquish any of its constitutional prerogatives. The plan would still leave Congress with the establishment of tariff policies and the fixing of the general standard of rates, but would give the Tariff Commission the power to adjust those rates in the light of commercial pressures of the moment.

Greater Iron Production in Canada

Pig iron production in Canada for November is reported by the Dominion Bureau of Statistics at 95,426 gross tons. Except for the August output of 97,379 tons, this was the largest monthly figure for the year. It exceeded the October total of 93,186 tons by 2½ per cent, and was 2½ times as great as the 37,989 tons of November, 1927.

For the first 11 months the production of 934,085 tons is 43 per cent greater than the 646,500 tons of the corresponding period of last year, and is almost as far ahead of the first 11 months of 1926 (683,532 tons). There were eight furnaces in blast Nov. 30, compared with seven a month earlier.

Production of ingots and steel castings in November was 108,463 gross tons; this was ½ per cent lower than the 108,987 tons of October, but was 34 per cent in excess of the 80,730 tons of November, 1927. Included in the current figures were 104,501 tons of ingots and 3962 tons of castings.

For the first 11 months, ingots and castings amounted to 1,137,160 tons; this showed an increase of 40 per cent over the 811,390 tons for the first 11 months last year, and of 58 per cent over the 718,395 tons in the first 11 months of 1926. This year's output included 1,097,977 tons of ingots and 39,183 tons of castings.

Ferroalloys produced in November amounted to 4532 tons, compared with 2127 tons in October. For the first 11 months, however, there has been a decline of 24 per cent from 52,161 tons last year to 40,073 tons this year.

W. J. Rainey, Inc., has acquired from the Hillman Coal & Coke Co. approximately 3000 acres of coal, adjoining the Clyde Coal Co. property which was bought by the Rainey interests earlier in the year. The latest purchase is for the purpose of consolidating the Clyde properties, which were separated by the Hillman lands. It is understood in the trade that coal from the Clyde mines will be shipped by river to the Davison Coke & Iron Co., which is building a 35-oven by-product coking plant there.

Quiet Rules in European Markets

Approach of Holidays Noticed—Better Shipbuilding Orders in England—Far East Stagnant

(By Cablegram)

LONDON, ENGLAND, Dec. 17.

PIG iron demand is quieting as the holiday season approaches, but most Cleveland furnaces now are quoting with January as the earliest delivery to date. Stocks have been reduced, during the past three months, by 60,000 tons, and an increase in the rate of output is anticipated in the new year.

Hematite is firm. Foreign ore markets are firm, but business is practically idle.

Finished iron and steel demand has improved, largely on account of recent increases in shipbuilding orders, which, on the North-East Coast, have totaled 500,000 tons during the past two months. Hence steel makers are looking for an increased demand for heavy material.

General export sales are still quiet. Vickers, Ltd., Sheffield, Sir William G. Armstrong, Whitworth & Co., Newcastle-on-Tyne, and Cammell, Laird & Co., Sheffield, have combined as to certain departments and have formed the English Steel Corporation.

November exports of iron and steel amounted to 399,400 gross tons. Of this amount 37,800 tons was pig iron, of which only 100 tons was consigned to the United States.

Tin plate markets are quiet, but inquiry is improving. Makers are well sold for the early part of next year and there is talk of price ad-

vances. Current output is about 65 per cent of capacity, owing to the fact that several mills are idle, working off the agreed stoppage period of a few weeks.

Galvanized sheets are moderately active, in small parcels, but black sheets are quiet.

On the Continent of Europe

Continental iron and steel markets are quiet on both sides of the channel and prices are tending to easier levels.

British users of semi-finished material are concentrating on British steel, as Continental forward deliveries are subjected to too great delays. Export demand, for traders in England, is poor.

German November production of pig iron was only 267,400 metric tons, a decrease of 74 per cent. Blast furnaces operating at Nov. 30 were 48.

South Africa is to ask for 40 new locomotives, costing about £300,000 (\$1,455,000).

Far Eastern Merchants Not Buying Chinese Await New Tariff and Japanese Expect Lifting of Gold Embargo—Test on Steel Marking Postponed

NEW YORK, Dec. 18.—Export trade with Far Eastern markets continues small. Chinese merchants are evidently delaying all but necessary purchases of material until the new Chinese tariff has become effective and Japanese buyers are awaiting the expected end of the Government's gold embargo. Inquiry from China for wire shorts and second hand material, such as plate cuttings and bar crops, continues fairly active, but only occasional transactions are reported with sellers here. American wire mills and exporters to the Far East have evidently lost interest in selling wire

shorts, even at the Chinese offering prices of today, which are sometimes as much as \$50 per ton, c.i.f. Chinese port. The tonnages sold are small and the profits as a rule negligible. Some business in plate cuttings is reported when Chinese merchants are willing to pay \$30 per ton, or more, c.i.f. Shanghai.

In addition to rail inquiries from Japan, mills are bidding on the usual quarterly tin plate requirements of the Nippon Oil Co. While the present inquiry is for only 35,000 base boxes of oil can sizes, it is suggested by exporters to Japan that this ton-

British and Continental European prices per gross ton, except where otherwise stated, f.o.b. makers' works with American equivalent figured at \$4.85 per £ as follows:

Durham coke, del'd.....	£0 17½s.	\$4.24
Bilbao Rubio ore*.....	1 2 to £1 2½s.	5.34 to \$5.46
Cleveland No. 1 foundry.....	3 8½ to 3 9½	16.61 to 16.85
Cleveland No. 3 foundry.....	3 6	16.00
Cleveland No. 4 foundry.....	3 5	15.76
Cleveland No. 4 forge.....	3 4½	15.64
Cleveland basic (nom.).....	3 5	15.76
East Coast mixed.....	3 11	17.22
East Coast hematite.....	3 11½	17.34
Rails, 60 lb. and up.....	7 15 to 8 5	37.59 to 40.01
Billets.....	6 5 to 6 10	30.31 to 31.53
Ferromanganese.....	13 15	66.69
Ferromanganese (export).....	14 0	67.90
Sheet and tin plate bars, Welsh.....	6 0	29.10
Tin plate, base box.....	0 18 to 0 18½	4.37 to 4.39
Black sheets, Japanese specifications.....	13 7½	64.87
Ship plates.....	7 12½ to 8 2½	C. per Lb. 1.66 to 1.76
Boiler plates.....	9 0 to 10 10	1.95 to 2.27
Tees.....	8 2½ to 8 12½	1.76 to 1.86
Channels.....	7 7½ to 7 17½	1.60 to 1.71
Beams.....	7 2½ to 7 12½	1.55 to 1.65
Round bars, ¾ to 3 in.....	7 10 to 8 0	1.63 to 1.73
Steel hoops.....	9 0 to 10 0	1.95 to 2.16
Black sheets, 24 gage.....	10 0	2.16
Galv. sheets, 24 gage.....	13 10 to 13 15	2.93 to 2.98
Cold rolled steel strip, 20 gage (nom.).....	16 0	3.47

*Ex-ship, Tees, nominal.

Continental Prices All F.O.B. Channel Ports

(Per Metric Ton)			
Foundry pig iron (a):			
Belgium.....	£3 3¼s. to £3 6s.	\$15.39 to \$16.00	
France.....	3 3¼ to 3 6	15.39 to 16.00	
Luxemburg.....	3 3¼ to 3 6	15.39 to 16.00	
Basic pig iron (a):			
Belgium.....	3 4¼ to 3 5¼	15.64 to 15.88	
France.....	3 4¼ to 3 5¼	15.64 to 15.88	
Luxemburg.....	3 4¼ to 3 5¼	15.64 to 15.88	
Coke.....	0 18	4.37	
Billets:			
Belgium.....	5 1¼	24.61	
France.....	5 1¼	24.61	
Merchant bars:			
Belgium.....	6 2¼	1.33	C. per Lb.
France.....	6 2¼	1.33	
Luxemburg.....	6 2¼	1.33	
Joists (beams):			
Belgium.....	5 2¼	1.11	
France.....	5 2¼	1.11	
Luxemburg.....	5 2¼	1.11	
Angles:			
Belgium.....	6 1¼	1.32	
¾-in. plate:			
Belgium (a).....	6 12	1.43	
Germany (a).....	6 12	1.43	
¾-in. ship plate:			
Belgium.....	6 7	1.38	
Luxemburg.....	6 7	1.38	
Sheets, heavy:			
Belgium.....	6 1	1.31	
Germany.....	6 1	1.31	

(a) Nominal.

nage may be doubled when the order is placed.

Importers of Continental steel in New York are taking some small business in certain special products, such as furring channels and chromium alloys of steel. Occasional transactions are reported in imported shapes and bars, but in most cases purchases are from importers' stocks or represent old orders on which delivery from Continental mills has been delayed. Prices are slightly lower than a few weeks ago, but shapes still range from 1.83c. to 1.85c. per lb., duty paid, New York, and bars are about 2c. per lb., duty paid, New York.

Customs Court hearings on the marking of foreign steel with the country of origin have been postponed to the middle of January from Dec. 18 and 19, when the first cases of domestic steel companies against importers of steel were scheduled. Importers are understood to be prepared to aid the Treasury Department in defending its ruling on marking and are also reported considering appearing at the hearings on the tariff beginning next month in Washington.

British Exports Up, While Imports Decline

WASHINGTON, Dec. 15.—Exports of iron and steel products from the United Kingdom increased to 399,447 gross tons in November, from 377,390 tons in October, while imports dropped to 232,767 tons from 261,404 tons, according to a cablegram received by the iron and steel division, Department of Commerce, from William L. Cooper, commercial attaché, London. Production of both pig iron and steel ingots and castings showed a gain. Pig iron output rose to 544,400 tons from 543,600 tons, and ingots and castings increased to 762,500 tons from 756,000 tons. At the end of November 135 blast furnaces were lighted, against 136 at the end of October, while the number of open-hearth furnaces in operation had increased to 287 from 264.

Increases in exports in November were reflected in 14 of the 22 classes, losses being made in the remaining eight. The principal gains were in rails, which increased 16,568 tons to

40,243 tons; wrought tubes, pipes and fittings, which increased 7143 tons to 27,388 tons; "other manufactures of iron and steel," which increased 6092 tons to 37,741 tons; galvanized sheets, which increased 2831 tons to 73,862 tons, and railroad material, other than rails, which increased 2748 tons to 14,103 tons.

Of the 19 classes in the import trade, 13 reflected losses. The decrease of ingots and semi-finished steel, amounting to 16,167 tons, accounted for more than one-half of the total decline of 28,637 tons.

German Rail Rates Reduced on Exports

HAMBURG, GERMANY, Nov. 23.—Railroad freight rates on iron and steel and non-ferrous metals for export are to be reduced by the German Railroad Directory. The present rates, which are lower than the domestic charges, are to be reduced 1.10 m. (26c.) per 100 km. As the average distance to seaboard from the Rhenish-Westphalian plants is 280 km., this amounts to a cut of about 3 m. (72c.) per ton. The reduction will be about 6 m. (\$1.43) per ton on shipments from works in Upper Silesia. The rate revision will not apply to shipments to Belgian or Dutch ports.

Austrian Home Demand Continues Active

VIENNA, AUSTRIA, Nov. 29.—The lockout at steel mills in Germany resulted in a slight increase in demand for steel products from Austrian sellers, but only a limited tonnage was available. Domestic business is active, and there is a fair volume of export tonnage. The latest report of the Alpine Montan A.G. shows a decided increase in the number of unfilled orders on its books, particularly in bars and structural material.

In October steel mills operated at practically full capacity, but pig iron output was only about 75 per cent. Automobile builders are active, and there is a good tonnage of business in special grades of steel and wire. Output of iron ore in the second quarter

of 1928 was 475,369 metric tons, compared with 424,955 tons in the first quarter. Export business has been good in recent months, particularly in iron and steel bars. Sheet and tube exports were considerably smaller than imports of those products.

So-called "rationalization" in industry is proceeding, and since 1926 improvements in production methods have resulted in a reduction of about 40,000, from a total of about 1,000,000 employed in the Austrian metal industry. While wages have been advanced, wages as an item of cost in production have declined. In the automobile industry wages have risen about 6 per cent, but the wage cost per car has gone down 4 per cent.

German Exports and Imports Show Drop

WASHINGTON, Dec. 14.—Exports and imports of iron and steel in the German international trade showed declines in October as compared with September, while production of pig iron and steel ingots showed increases, according to a cablegram received by the Department of Commerce from Commercial Attaché Fayette W. Allport, Berlin.

October exports totaled 345,439 metric tons as against 407,563 tons in September, a decrease of 62,024 tons or 15.3 per cent and imports declined to 148,561 tons as compared to 156,596 tons, a drop of 5.1 per cent. Pig iron output was 1,025,895 tons as against 985,413 tons and steel ingot production was 1,306,338 tons as compared to 1,189,521 tons.

German Reparations Shipments Large in October

HAMBURG, GERMANY, Dec. 1.—The total value of steel and machinery shipments on reparations account in the first 10 months of this year was 101,000,000 m. (\$24,068,300). There has been a fairly steady increase in such shipments during the year, and the total for October was considerably larger than for September. October shipments included 5,000,000 m. (\$1,191,500) of industrial machinery, 1,700,000 m. (\$405,110) of electrical equipment, 4,700,000 m. (\$1,120,010) of steel products, 1,100,000 m. (\$262,130) of non-ferrous metals and 13,300,000 m. (\$3,169,390) of hardware.

German Steel Tariff Reduction Possible

HAMBURG, GERMANY, Dec. 1.—Reduction in the duties on certain iron and steel items appears probable in a new tariff to be considered by the Reichstag early next year. The proposed schedule lowers the duties on about 130 items, including certain iron and steel products and machinery. These reductions in duty would be applied only on imports from countries with which Germany has a commercial treaty, such as the United States.

BRITISH FOREIGN TRADE IN IRON AND STEEL PRODUCTS
(In Gross Tons)

	Imports		Exports	
	October	November	October	November
Pig iron and ferroalloys.....	6,283	5,596	43,439	43,530
Ingots, blooms, billets and slabs.....	119,914	103,747	3,035	2,543
Iron bars, rods and angles.....	11,714	15,706	2,147	2,753
Steel bars, rods and angles.....	38,417	30,432	28,170	29,911
Structural steel.....	15,956	12,333	7,214	8,021
Hoops and strips.....	14,236	12,685	5,356	5,495
Plates and sheets.....	17,670	19,668	45,798	44,148
Galvanized sheets.....	.....	.....	71,031	73,862
Tin plate.....	.....	.....	54,210	41,204
Cast tubes, pipe and fittings.....	3,835	3,492	11,915	10,954
Wrought tubes, pipe and fittings.....	7,515	4,951	20,245	27,388
Rails.....	1,137	542	23,775	40,243
Other railroad material.....	578	268	11,355	14,103
Wire.....	5,938	5,365	8,072	7,569
Wire cable and rope.....	.....	.....	2,309	2,327
Wire nails, including staples.....	5,266	5,771	218	237
Other wire manufactures.....	493	356	2,402	1,670
Nails, tacks, rivets and washers.....	759	1,109	1,706	1,856
Bolts, nuts and metal screws.....	1,315	1,352	2,986	3,681
Iron and steel castings.....	1,251	1,382	292	197
Iron and steel forgings.....	905	746	66	14
Other manufactures.....	8,222	7,266	31,649	37,741
Total.....	261,404	232,767	377,390	399,447

Controlling Fuel in Steel Plants

Oil and Gas Fuel for Open-Hearths Before British Fuel Institute—Systematic Scheme for Rolling Mills—Pre-mixing Burners for Hot-Blast Stoves

(Special Correspondence)

LONDON, ENGLAND, Nov. 30.—The autumn meeting of the (British) Institute of Fuels was held in London late in November, and one of the sessions was devoted to a discussion of the value of scientific control in the fuel-consuming operations in the steel industry.

An American Engineer's Opinion

Martin J. Conway, fuel engineer to the Lukens Steel Co., Coatesville, Pa., stated that fuel oil to be used economically must be correctly atomized, which means primarily that the oil at the point of atomization, which is usually the burner, must have the right viscosity, and as viscosity is a function of temperature the fuel oil system should be so designed that the proper oil temperature can be maintained at all rates of flow.

The success of fuel oil used on open-hearth furnaces depends upon constant pressure and constant temperature. Constant pressure can be maintained by the use of a pressure unloading valve or pressure regulating valve placed at some point on the delivery line beyond the most distant furnace in the shop where it will discharge the surplus oil into the return line.

Constant temperature can be maintained by thermostatic control of the oil leaving the heater and the steam entering the heater, this heater being preferably situated on the discharge side of the pump, utilizing the low pressure exhaust from the pump turbines with a high pressure connection for starting up or emergency purposes, should the spare pumping unit be electrically driven. The temperature of the oil required to produce the best viscosity for atomization is usually not more than 160 deg. Fahr. at the burner for the heaviest liquid fuel.

It is unnecessary to heat the liquid fuel beyond this point for several reasons, one being the unnecessary waste of steam because the drop in viscosity is very small compared with the increased temperature.

Some of the advantages to be obtained by the use of liquid fuel were given by Mr. Conway as follows:

"It does not deteriorate or lose its fuel value in storage. It is easy to store and easy to convey to the point of consumption. It burns with a very high flame temperature, but on account of ready control of flame direction it permits greater refractory life and simpler furnace design. Checkers remain clean longer with fuel oil than with producer gas.

"On account of the smaller volume of waste gases to be handled, stack capacity requirements are reduced 35 per cent when compared with producer gas.

"Due to the fact that liquid fuel can be metered, individual furnace performance can be readily measured, thereby allowing the executive to compare the efficiency of his furnace operators."

Constant High-Quality Gas Necessary

"Fuel Control in Open-Hearth Practice" was discussed by J. Lloyd Bentley of Robert Heath & Low Moor, Ltd., who stated that the first essential to secure economy of fuel was constant high quality of producer gas composition. Another essential, he said, was that the air supply should be controlled so as to secure a high flame temperature and the least oxidizing atmosphere. Control of gas quality and pressure to the furnace, control of air supply through the valves, and control of draft, were all essentials for economical working of the furnace.

Mr. Bentley advocated continuous recording by suitable graphs, allowing operators to note the results of control side by side with results obtained in furnace operation of output and of fuel consumption. He urged that the fuel engineer must gain the confidence of managers and men of the particular units under investigation, and said that personality and tact were important essentials.

Fuel Control in Forge and Rolling Mill Practice

The subject of fuel control was dealt with by H. C. Armstrong of John Brown & Co., Ltd., who stated that the most important duty of the fuel officer was to watch that no more fuel was burnt than was necessary to perform the required heating operations successfully, and to satisfy the temperature requirements of the forge master. The first step was to recognize the necessity of measuring the amount of fuel used over a definite period; a considerable saving has invariably followed the adoption of a practice of making a systematic weekly return from each shop.

The weekly data required for systematic control are not great, and need not consist of more than:

- (a) Fuel used.
- (b) Material heated or produced.
- (c) Furnace hours during which the heating continues.

From these are calculated:

- (d) Fuel per unit weight (ton) of output.
- (e) Output per furnace hour.
- (f) Fuel per furnace hour.

It is on the last of these items, i.e., the fuel burnt per furnace hour, that Mr. Armstrong has built up his methods. Fuel consumption figures are frequently taken as impossible of improvement without thought to the true significance of the manner in which they are presented. The almost universal habit of speaking of fuel per ton is entirely misleading unless output figures are given at the same time. Low fuel per ton figures are glibly quoted to illustrate the "high" efficiency of some particular furnace without mention being made of the highly favorable load conditions that have contributed to the result. Similarly, when discussing the matter with the shop manager, it is usual for him, not unnaturally, to speak of a figure which represents the best practice of his furnaces. Any other result is brushed aside as not typical, and as being obtained under unsatisfactory conditions, notwithstanding the fact that those conditions may be the most prevalent.

Fuel Control in Hot Blast Stoves

J. B. Fortune of the New Cransley Iron & Steel Co., Ltd., said that, to improve the combustion and the efficiency of any battery of hot blast stoves, scientific control should proceed along the following lines:

The gas supply should first of all be rendered fit for satisfactory burning by some method of gas cleaning. The existing burning arrangements should be brought up to their highest efficiency by checking the combustion from flue gas analyses, and reducing the excess air as much as possible. If the working conditions are such that flue gas tests indicate a fair efficiency, then the provision of continuously recording CO₂ meters on all the stoves is recommended.

To obtain the best results in combustion control, a good type of pre-mixing burner should be installed and operated in conjunction with CO₂ recorders. Very variable pressure conditions in the gas supply should be leveled out by means of an automatic regulator. The utmost refinement in combustion control necessitates the supply of combustion air under pressure, automatic control to maintain a constant ratio of gas and air, an efficient pre-mixing burner, and continual checks upon combustion by the use of CO₂ and CO continuous recorders coupled up to the stove connection to the chimney flue.

Milwaukee Company Buys Eller Mfg. Co.

The Milwaukee Corrugated Co., Milwaukee, maker of sheet metal building products, has purchased the Eller Mfg. Co., Canton, Ohio, maker of corrugated steel awnings and other products, and will take over its management on Jan. 1. The Eller company will continue to serve its customers without change in personnel, but its manufacturing activities will be extended and machinery added for new products. Later the company will make metal lath, corner bead, channels, road strips, stove pipe, furnace pipe and all types of conductor, furnace and stove pipe elbows. The plant will be used largely to serve Eastern and foreign customers of the Milwaukee company.

Republic Brass Corporation Combines Six Companies

Organization of the Republic Brass Corporation, combining six large brass manufacturing companies, with assets of \$39,000,000, has been practically completed with the ratification of the consolidation by stockholders of the constituent companies. As mentioned in THE IRON AGE of Dec. 6, page 1474, the new corporation will acquire the assets, business and good will of the Rome Brass & Copper Co., Rome, N. Y.; the Michigan Copper & Brass Co. and the Higgins Brass & Mfg. Co., Detroit; the Taunton-New Bedford Copper Co., Taunton and New Bedford, Mass.; the Dallas Brass & Copper Co., Chicago, and the Baltimore sheet mill of the General Cable Corporation, Baltimore. Through stock ownership in the Michigan Brass & Copper Co., the American Smelting & Refining Co. will have a substantial common stock holding in the new corporation.

Barton Haselton, president Rome Brass & Copper Co., will be chairman of the board of the new corporation, and George H. Allen, president Michigan Copper & Brass Co., will be president. Directors will include Walter C. Baylies, chairman of the executive committee Edison Electric Illuminating Co., Boston; Francis H. Brownell, chairman of the finance committee American Smelting & Refining Co.; Walter P. Chrysler, president Chrysler Corporation; H. T. Dyett, vice-president General Cable Corporation; Samuel L. Fuller of Kissel, Kinnicutt & Co., New York investment bankers; C. S. Mott, vice-president General Motors Corporation; W. H. Peirce, vice-president American Smelting & Refining Co.; Walter Robbins, president General Cable Corporation; Alfred P. Sloan, Jr., president General Motors Corporation, and Roger W. Straus, vice-president American Smelting & Refining Co.

The capitalization of the new corporation will consist of \$10,000,000 first mortgage 6 per cent bonds, \$10,000,000 7 per cent preferred stock,

250,000 shares of no par value Class A stock and approximately 510,000 shares of no par value common stock. Kissel, Kinnicutt & Co. will soon make a public stock offering.

Rolling Mill to Be Built at Calgary

WASHINGTON, Dec. 18.—The Manitoba Bridge & Iron Works, Ltd., Winnipeg, which operates a rolling mill at Selkirk, Man., is planning to erect a plant at Calgary, according to a report received by the Department of Commerce from Trade Commissioner J. Bartlett Richards, Winnipeg. The new unit, which will produce light structural steel, bars, rods, plates and castings, will employ about 160 men and when completed will represent an initial outlay of approximately \$400,000. The greater part of the equipment will be taken from two rolling mills, one at Medicine Hat and the other at Redcliff, Alta., which the company purchased last summer and which are about to be dismantled. The new mill will constitute the second steel company in Calgary, the Riverside Iron Works, Ltd., being in operation there, producing shapes, iron castings, machinery, etc.

Inland Company Organizes Limestone Subsidiary

The Inland Steel Co., Chicago, has organized a new corporation for the production of chemical and metallurgical limestone to be known as the Inland Lime & Stone Co. The project will be located in the eastern end of the northern peninsula of Michigan, about 25 miles east of Manistique. The business of the Manistique Lime & Stone Co. will be taken over and continued, and its stockholders will retain an interest in the new company. During the past year diamond drilling has been conducted on the lands owned or held under option by the Manistique company and George J. Nicholson, and a large tonnage of high calcium limestone has been proved up. In developing the project a large quarry will be opened, a railroad will be constructed to Lake Michigan, and a crushing and screening plant with suitable harbor and dock facilities will be constructed in the vicinity of Seul Choix Point, making the limestone available for transportation in lake vessels. Stone will be produced not only for use in the steel industry, but also for chemical purposes such as the paper industry, in which the Manistique company has already built up a substantial business.

That phase of the project will continue to be managed by George J. Nicholson and his assistants, Gordon Hughes and Walter Moon. The opening of the new quarry and the construction and operation of the new plant will be in charge of A. J. Cayia, for the past four years superintendent

of the Wakefield Mine of the M. A. Hanna Co. on the Gogebic Range in Michigan. The directors of the new company will be P. D. Block, L. E. Block, David P. Thompson, Clarence B. Randall, George J. Nicholson, Gordon Hughes and I. N. Bushong. The officers will be: David P. Thompson, president; Clarence B. Randall, assistant to the president; George J. Nicholson, vice-president; and W. D. Truesdale, secretary-treasurer. It is expected that the new plant will be put into operation during the latter part of 1930.

Standard Steel Building Manufacturers Organize

The Standard Steel Building Institute, composed of manufacturers of standard steel buildings, has been organized for cooperative trade extension. At a meeting held in the Stevens Hotel, Chicago, Dec. 6, the constitution and by-laws were adopted and the following officers were elected: C. I. Auten, Truscon Steel Co., Youngstown, president; W. A. Knapp, Butler Mfg. Co., Kansas City, Mo., vice-president; H. O. Davidson, Blaw-Knox Co., Pittsburgh, Pa., secretary-treasurer.

Representatives were present also from the Stefcu Steel Co., Michigan City, Ind.; Maryland Metal Building Co., Baltimore, and International Derrick & Equipment Co., Columbus, Ohio.

It will be the aim of the institute to acquaint American industry with the unusual merits of standard steel buildings, such as low first cost, speed of erection, durability, portability, ease of alteration, fire safeness and lightning protection.

Chattanooga Shop Builds Large Steel Drum

Combustion Engineering Corporation reports that its affiliated company, the Hedges-Walsh-Weidner Co., Chattanooga, Tenn., recently shipped to the Gulf States Creosoting Co. an unusually large steel drum for pressure creosoting. The shell is 140 ft. long, 8 ft. in diameter and has a plate thickness of 1 in. This is believed to be the largest steel drum ever shipped as a completely assembled unit. It weighs between 150 and 200 tons and required five flat cars for shipment.

Another shipment recently made from this plant was a car tank for nitric acid, said to be the first nitric acid car tank built in this country. This tank is 6 ft. 1½ in. inside diameter and 31 ft. 9 in. long. The top two-thirds of the shell is made of 5/16-in. steel, the bottom is made of 7/16-in. steel and the heads are made of 9/16-in. steel. This tank has a capacity of 7000 gal. and is first of seven stainless steel tanks to be built for the E. I. du Pont de Nemours & Co.

Trade Practice Rules Adopted at Chicago

Woodworking Manufacturers Draw Up Regulations in Conference with Trade Commission Representatives

AT a trade practice conference held Dec. 12 at the Hotel Sherman, Chicago, a set of 15 rules was adopted, for submission to the Federal Trade Commission, by representatives of manufacturers who make approximately 90 per cent of the woodworking machinery produced in this country and who comprise about half the number of companies in that industry. The meeting was sponsored by the Association of Manufacturers of Wood Working Machinery.

G. S. Ferguson, commissioner, and M. M. Flannery, director of trade practice conferences of the Federal Trade Commission, presided. The rules adopted are as follows:

1. Inducing of employees of competitors to violate contracts, or enticing away of employees of competitors in such numbers or under such circumstances as to constitute a conversion and an appropriation of the value created at the expense of the said competitor, is unfair trade practice.

2. The willful interference by any person, firm or corporation by any means or device whatsoever, with any existing contract or firm order between a seller and a purchaser of any product of the woodworking machinery manufacturing industry, such interference being for the purpose or with the effect of dissipating, destroying or appropriating in whole or in part the patronage or business of another engaged in such industry, is unfair trade practice.

3. Manifestly exaggerated or false statements by a manufacturer, agent, dealer or seller concerning the size, weight, working range, design, material, condition or performance of any of his own machines or parts thereof is unfair trade practice.

4. Manifestly exaggerated or false statements by a manufacturer, agent, dealer or seller concerning the size, weight, working range, design, material, condition or performance of any competitor's machine or part thereof, or the circulation of false statements or false reports of a disparaging nature concerning the personnel or the financial standing of competitors is unfair trade practice.

5. The payment or allowance to any customer of secret rebates, refunds, credits or unearned discounts, whether in the form of money or otherwise, is unfair trade practice.

6. The payment or promising to pay to any employee of a customer or prospective customer of a commission or consideration of any character is unfair trade practice.

7. The granting of either a selling commission or dealer's discount to any concern or individual other than an established woodworking machinery dealer or salesman is unfair trade practice.

8. As much confusion has arisen in the industry, resulting in many instances in price discrimination, as a result of members of the industry selling their product on a basis of free delivery in some instances and in others selling the same f.o.b. factory, we agree that all selling shall be based on delivery f.o.b. point of manufacture and that when delivery at any other point is necessary the proper transportation and handling

charges shall be added to the f.o.b. factory price; and that any variation from such practice shall be deemed to be an unfair method of competition.

9. Any discrimination in price between purchasers of the same class, (not including discrimination in price on account of the difference in grade, quality or quantity of the product sold, or which makes only due allowances for difference in cost of selling and transportation), or discrimination in price in the same or different communities not made in good faith to meet competition, where the effect of such discrimination may be to substantially lessen competition or tend to create a monopoly, is an unfair trade practice: *Provided*, however, that nothing in this resolution shall be construed to prevent the use, when published, as defined in Rule 10, of a special quantity price applicable to a definite quantity of goods which are placed in one order and are shipped as promptly as possible.

10. The members of the woodworking machinery industry, both manufacturers and dealers, while maintaining absolute freedom in the issuance of price schedules from time to time, in conformity with the established trade practices, do adopt as a cardinal principle that there shall be no discrimination as between purchasers of their product, and that all published prices as issued by any member shall set forth plainly the price and terms and conditions, and that such published prices shall truly represent the sales price in all cases where the goods sold and conditions and terms are set forth in the member's price schedule, and any deviation from the principle expressed herein shall be deemed an unfair trade practice.

11. The industry recognizes the fact that where the customer for a new machine is also disposing of an old machine, there are two distinct transactions involved, one being the sale of the new machine and the other being the purchase of the old machine. Therefore, the industry agrees that these two transactions shall be held distinct.

The industry further agrees that no price in excess of its fair market value shall be paid or allowed for on any used machine thus offered for sale by the prospective customer for a new machine.

12. The sale or offering for sale of any product of the woodworking machinery industry under any form of guarantee to the purchaser or prospective purchaser against either advance or protection against the decline in the price of said product is an unfair trade practice.

13. The industry hereby records its approval of the practice of distributing and circulating, to the entire industry, published current price lists, including all notices of advance or decline in prices made by any individual manufacturer, either by the manufacturer or by the association or group he may be identified with.

14. The industry hereby records its approval of the practice of making the terms of sale a part of all established price schedules, and the failure on the part of manufacturers or manufacturers' agents or dealers to strictly adhere to such terms of sale, or to willfully fail to enforce the collection under such, shall be termed an unfair trade practice.

15. The sale or offer for sale of a new machine as a repossessed or rebuilt ma-

chine, with accompanying price discrimination to favored buyers, is an unfair trade practice.

These rules will be studied as to their legality by the Federal Trade Commission. Those that are acceptable will be printed and distributed by the association to all manufacturers in the industry with the request that they adopt the practices recommended.

Lakewood and Jaeger Companies to Merge

A merger of the Jaeger Machine Co., Columbus, Ohio, and the Lakewood Engineering Co., Lakewood, a Cleveland suburb, has been approved by directors of the two companies and will be submitted to stockholders for their approval shortly. This merger will bring together two of the large manufacturers of concrete mixing, handling and placing machinery. The Jaeger company makes concrete and plaster mixers of various types and the Lakewood Engineering Co., in addition to the manufacture of concrete mixing and handling machinery for use in road construction, also makes industrial trucks and trailers. Each plant will continue to have its sales and distribution departments.

Under the merger plans the assets of the Lakewood company will be transferred to the Jaeger company and the stockholders of the former company will receive two shares of Jaeger stock for each share of Lakewood stock after there has first been declared to Jaeger stockholders a cash dividend equivalent to approximately \$5 per share.

Midwest Power Conference to Convene in February

The fourth Midwest Power Engineering Conference will be held at the Palmer House, Chicago, Feb. 12 to 15. Power plant substructure problems will be discussed on Feb. 12. On Feb. 13 there will be sessions on metallurgical and chemical problems and electrical engineering problems. The former will be featured by a paper on "Metallurgy of Material Used in Power Equipment," by A. E. White, University of Michigan, Ann Arbor, Mich., and a paper on "Researches in Corrosion" by K. H. Logan, electrical engineer Bureau of Standards, Washington. In a session on Feb. 14 devoted to power plant operation. H. H. Moss, Linde Air Products Co., New York, will deliver a paper on "Welding in Power Plant Construction and Maintenance," and P. J. Gaudy, Sessions Engineering Co., Chicago, will discuss "Coordination of Industrial Plant and Station Power." Other sessions will take up power plant economics and problems in heating, ventilating and refrigeration will have attention.

Building Promises to Increase Says C. N. Fitts

Charles N. Fitts, New England Structural Co., Boston, the newly-elected president of the American Institute of Steel Construction, Inc., on Dec. 13 met with the engineering staff of the steel fabricators' organization. Among those present were the district engineers of the institute, to whose work Mr. Fitts especially addressed himself. In the course of his remarks, Mr. Fitts said:

"Structural steel sales during 1928 were generally larger than last year. The money market has somewhat deterred bonded investments during the past month, but we find that only a temporary check on building. Orders now coming out indicate that our business promises to go forward at a fair increase."

Merger of New York Dry Dock Companies

The United Dry Docks Corporation, New York, has been organized to take over and consolidate the properties of the Morse Dry Dock & Repair Co., Brooklyn; the New York Harbor Dry Dock Co., Tompkinsville, S. I.; James Shewan & Sons, Brooklyn; Staten Island Shipbuilding Co., Mariners Harbor, S. I.; the Theodore A. Crane Sons Co., Brooklyn; and the W. & A. Fletcher Co., Hoboken, N. J. Officers of the present companies will be identified with the new organization, which plans expansion programs at the different plants. The merger may include two or three other shipyards in the New York territory and will probably be headed by E. P. Morse, president of the Morse company.

Productive Efficiency of Industry Increases

WASHINGTON, Dec. 14.—Between 1925 and 1927 there was a further increase in production per worker in both manufacturing and agricultural industry, said the annual report of E. Dana Durand, chief of the Division of Statistical Research, Department of Commerce, in discussing progress in national efficiency. In a table it was shown that as compared with the annual average for the period 1898 to 1900 the average for the two calendar years 1926 and 1927 showed an increase of approximately 55 per cent in the output of farm products, 280 per cent in the output of minerals (an exceptionally large figure owing particularly to the immense expansion in petroleum production), about 180 per cent in factory output, and over 200 per cent in the volume of rail transportation.

These figures compare with an addition of about 55 per cent to the population of the country. It is obvious, the report said, that there is produced for each person in the population a far greater volume of goods and ser-

vices than at the beginning of the century, which means, of course, a great advance in living standards. In the case of every one of these four major branches of industry the increase in output since 1898 and 1900 has been far greater than that in the number of workers. In agriculture, manufactures, and railroads the product of goods or services per worker engaged has increased from 50 to 60 per cent.

Automobile Companies Are Increasing Production

Steadily increasing production by manufacturers introducing new models, with a generally high rate of output in practically all car and truck factories, gives promise of bringing the December total in excess of 300,000, according to *Automotive Industries*. The holiday season probably will have less effect on factory operations than in any year in the industry's history. Demand for deliveries of new cars has fallen to the low point of the year, so much so that Ford dealers in many parts of the country are able to make immediate deliveries, though still carrying large banks of orders for deliveries after Jan. 1. Much of the selling in all lines during December is for delivery after Jan. 1, resulting in some accumulation of new car stocks.

Would Study Plans of War Needs

WASHINGTON, Dec. 14.—Discussing reserve stocks of war material, Assistant Secretary of War Charles B. Robbins, in the Department's annual report, says the preparation of a definite plan to supply information as to what are the requirements in mobilization of material is the greatest need now confronting the army. The plan would be a specific forecast of the effort required adequately to defend the nation from invasion during the period of industrial transposition. With executive approval of such a plan and legislative sympathy in such a plan, it will be possible for the first time, it is stated, to submit for the attention of Congress a definite program for peace-time accumulation and maintenance of essential stocks.

Assistant Secretary Robbins repeated a recommendation that a board be appointed to determine war-time munition needs. If the appointment of such a board is not deemed advisable, he said, it is strongly recommended that the War Department and the Navy Department jointly prepare for the approval of the President and presentation to Congress a specific project for defence of the country from attack by any enemy or coalition of enemies which might arise.

Such a project, it was declared, should take into account the country's geographical isolation, the initial resistance of the navy, the present size of the army, the strength of the nation's man power and the stage of

industrial development. It should give consideration to the time needed for training troops, the initial rate of production of munitions, the period required for industry to come into mass production for war and the necessary war reserves of finished articles. The Assistant Secretary of War also again recommends passage of the bill providing for educational orders to be placed with industries during peace-time.

November British Iron and Steel Output Higher

LONDON, ENGLAND, Dec. 14 (*By Cable*).—November pig iron production was 544,400 gross tons and that of steel ingots and castings was 762,500 tons, both larger than in October.

A comparison of the November output with October and with the monthly rate for the first nine months of this year, as well as with the rates for previous years, is as follows, in gross tons:

	Pig Iron, Tons	Steel Ingots and Castings, Tons
1913—Av. monthly...	855,000	638,600
1920—Av. monthly...	669,500	755,600
1922—Av. monthly...	408,500	490,100
1923—Av. monthly...	620,000	706,800
1924—Av. monthly...	609,900	685,100
1925—Av. monthly...	519,700	616,400
1926—Av. monthly...	203,500	296,700
1927—Av. monthly...	607,800	758,200
1928—To Oct. 1, monthly....	552,800	702,700
1928—October.....	543,600	756,000
1923—November....	544,400	762,500

To Dec. 1, the monthly rate of pig iron output has been 551,200 tons and that of steel 713,000 tons—both lower than in 1927.

Packard Company Has Made Large Plant Additions

The Packard Motor Car Co., Detroit, the factory program of which now amounts to nearly \$10,000,000 a year for new machinery and equipment and the rebuilding of many departments, recently included a new aluminum foundry, a large addition to the stamping factory and the rebuilding of the power plant. Building No. 21, which is one of the 79 structures comprising the Packard plant, was completed recently in 60 days. It is three stories high, 190 x 382 ft. and embraces a glass covered court 60 x 320 ft. This building, which brought the floor space of the Packard plant up to 3,200,000 sq. ft., was built to carry several additional floors when needed and contractors are now adding two floors, which, when completed, will afford nearly 300,000 sq. ft. of floor space.

The new \$1,000,000 plant of the General Motors Corporation at Regina, Saskatchewan, which will employ about 800 men, was opened this week. It is expected that bodies for two General Motors cars will be produced in this plant, the primary purpose of which is the assembling of cars destined for western Canada.

Youngstown-Ohio River Rail Link Favored

Interstate Commerce Commission Admits Need for Lower Rates on Coal to Youngstown District—Allows Further Hearings

WASHINGTON, Dec. 18.—Iron and steel manufacturers in the Youngstown district were favored in a decision announced today by the Interstate Commerce Commission in passing upon the application of the Pittsburgh, Lisbon & Western Railroad for authority to construct two branches which would give Youngstown rail connection with the Ohio River.

The commission said that public convenience and necessity require rail transportation between the Ohio River and the Youngstown district in connection with transportation on the river and connecting waterways. However, the record was held open and further hearing was assigned to secure evidence bearing upon the practicability of providing such rail transportation over existing lines.

This indicates that the trunk lines, the Pennsylvania and Pittsburgh & Lake Erie railroads, will have to afford lower rates by water and rail on coal from the Pittsburgh and Connellsville districts to the Youngstown district or new construction will be permitted. Thus, regardless of whether the P. L. & W. finally is allowed to build the lines, it is evident that Youngstown will be given lower rates on incoming shipments of coal. Reduced rates by the Trunk Line carriers might be arranged by establishing rail-and-water connection with the Youngstown district by the Pennsylvania water connection at Rochester, Pa., and by the Pittsburgh & Lake Erie water connection at Monaca, Pa.

Possible Cut of 70c. a Ton on Coal Rate

The present all-rail rate on coal to the Youngstown district from the Pittsburgh district is \$1.34 a ton, while from the Connellsville district it is \$1.43 a ton. It was estimated that the proposed water-and-rail rates through use of the proposed P., L. & W. lines would be a minimum of 50c. a ton and a maximum of 75c. a ton, with a possible average of 60c. The Youngstown district consumes approximately 8,000,000 tons of bituminous coal annually, and based on a possible cut of 70c. a ton in the rate on coal, it is estimated that the Youngstown iron and steel industry would save about \$5,600,000 annually. This would reflect itself in reduced cost of making pig iron and steel. Moreover, connection with the Ohio River would give the Youngstown district a rail-and-water outlet for shipment of steel to the South and Southwest by way of the Ohio and Mississippi rivers, cheapening transportation costs and placing Youngstown in a better position to compete with the Pittsburgh, Wheeling and

Steubenville districts, which now have access to water shipments.

Railroads Must Clarify Position

"Authority to construct the proposed new line," the commission's report said, "will not be granted until we are fully satisfied that a use of the existing rail routes between the Ohio River and the Youngstown district, which will produce substantially the results proposed by the applicant (P., L. & W. Railroad), is impracticable." It was added that the Pittsburgh & Lake Erie and the Pennsylvania will be expected to make their position in regard to the proposed use of their lines entirely clear so that the commission may be fully advised in the matter.

Objects to Operation by Coal Company

The P., L. & W. Railroad is owned by the Pittsburgh Coal Co., which would ship much of the tonnage of coal over the proposed lines. The commission said that the practical control and operation of a common carrier by its principal shipper is a condition to be avoided. It also pointed out that it is proposed that the transfer facilities at the Ohio River shall be under control of either the Lisbon Railroad or of the Youngstown Sheet & Tube Co. The commission added that, should the new construction be permitted, consideration will be given to the imposition of a condition that the P., L. & W. shall not be under the control, direct or indirect, of the Pittsburgh Coal Co., "or any other industry or industries, and the further condition that terminal facilities shall be provided on the Ohio River which shall not be under such control and shall be open to the free use of all shippers."

Says Prosperity Factors Are Still Present

WASHINGTON, Dec. 18.—All of the basic factors which have contributed to the healthy state of business during recent months, among which may be mentioned more efficient production and distribution with a smaller accumulation of stock and the well-sustained confidence in the stability of existing conditions, are still present with no visible signs of receding, according to Secretary of Commerce Whiting. It was pointed out that a slight recession in the output of some commodities may be expected as the time for inventory taking nears. Available statistics were declared to show that trade and industry generally are in record volume with retail trade showing an expansion over recent months due largely to the holiday demands. The recent fluctua-

tions in the stock markets, Mr. Whiting said, are now generally believed to have strengthened business by bringing stock prices nearer to their intrinsic value.

"Any forecast of future conditions, of course, can only be based upon the forces in motion," it was stated. "Most of the basic industries for which statistics are available have been active throughout the entire year. Automobile production, estimating for the month of December, will doubtless exceed the previous high record of 1926, when 4,299,000 passenger cars and trucks were produced; steel production during the year promises to increase over 1927, when the output totaled 43,041,000 tons; available statistics indicate that the output of copper will advance over last year, when mine production amounted to 829,978 short tons.

"Exports of merchandise during the first 11 months of 1928, according to preliminary figures, were valued at \$4,655,459,000, being higher than for any corresponding period since 1920 and \$197,724,000 in excess of exports for the corresponding period of 1927. This larger volume of export trade has contributed greatly to our domestic activity.

"A further note of stability is added by the fact that exports of merchandise for October and November of this year, \$550,866,000 and \$546,000,000 (preliminary figures), respectively, were larger than for any previous month since January, 1921, when exports were valued at \$654,300,000."

High Shipments of Fabricated Structural Steel

WASHINGTON, Dec. 18.—Orders for fabricated structural steel in November totaled 187,331 tons, or 65 per cent of the 289,975-ton capacity of the 195 reporting firms, according to the Department of Commerce. Orders reported in October were 192,854 tons, or 64 per cent of the capacity of the 215 reporting firms. Computed orders in November aggregated 243,750 tons, against 240,000 tons in October, while shipments were 288,750 tons, or 77 per cent of capacity, compared with 322,500 tons, or 86 per cent of capacity.

Except for October, the computed tonnage of new orders was the smallest since last April. Shipments, however, were above the average of the previous 10 months, having been exceeded, this year, only by October and August. November orders were 3 per cent above last year; shipments were 17 per cent higher than in 1927.

Computed orders for the 11 months of the current year totaled 3,041,250 tons, or 74 per cent of capacity, against 2,805,000 tons, or 68 per cent of capacity, for the corresponding period of last year. Computed shipments were 2,902,500 tons, or 70 per cent of capacity, against 2,655,000 tons, or 64 per cent of capacity; for the corresponding period of last year.

Fabricated Structural Steel

Awards Decline to 17,200 Tons—New Projects

Call for 23,250 Tons

INCLUDING 8000 tons for two car ferries for the Pere Marquette Railroad, awards reported during the week amounted only to 17,200 tons, one of the lowest totals of the year. Outstanding among new projects, which will require 23,250 tons, were a bank building at Minneapolis, calling for 6000 tons, a section of the New York subway, which will require 4200 tons, and grade elimination work in connection with the new Cleveland station, calling for 4000 tons. Awards follow:

NEW YORK, 800 tons, apartment building in West Seventy-second Street, to Taylor-Fichter Steel Construction Co.
STATE OF NEW YORK, 125 tons, highway bridge, to American Bridge Co.

LEHIGH VALLEY RAILROAD, 400 tons, building work at Jersey City, to Bethlehem Steel Co.

CENTRAL RAILROAD OF NEW JERSEY, 125 tons, bridge at Bartley, N. J., to Phoenix Bridge Co.

DOVER, N. J., 1550 tons, Picatinny Arsenal buildings, to Bethlehem Fabricators, Inc.

WARNER, N. J., 300 tons, power house for American Cyanamid Co., to American Fabricators Steel Co., Philadelphia.

ATLANTIC CITY, N. J., 250 tons, Park Lane Hotel, to McClintic-Marshall Co.

CHARLESTON, W. VA., 200 tons, building for Libby-Owens Plate Glass Co., to Pittsburgh Bridge & Iron Co.

RALEIGH, N. C., 500 tons, bank building, to Dietrich Brothers.

DETROIT, 422 tons, *Detroit Times* Building, to McClintic-Marshall Co.

BUFFALO, 270 tons, platform for New York Central depot, to Lackawanna Steel Construction Co.

LOUISVILLE & NASHVILLE RAILROAD, 200 tons, bridge work, to American Bridge Co.

SOUTH BEND, IND., 350 tons, building for Building and Loan Association, to Duffin Iron Co., Chicago.

PRAIRIE DU CHIEN, WIS., 1800 tons, toll bridge across Mississippi River, to Austin Bridge Co., Austin, Tex.

SUPERIOR, WIS., 700 tons, coal bridge, to American Bridge Co.

CHICAGO, 190 tons, field houses for Northwest Park Board, to Duffin Iron Co., local.

GREEN BAY, WIS., 400 tons, hotel, to Vulcan Iron Works, Fond du Lac.

PERE MARQUETTE RAILROAD, 8000 tons, two ferry boats, to Manitowoc Shipbuilding Co.

STATE OF WASHINGTON, 700 tons, power house for Stone & Webster, Inc., to Pacific Car & Foundry Co.; reported last week to unnamed fabricator.

SEATTLE, 250 tons plates, outlet pipes for Diablo Dam, to Willamette Iron & Steel Works.

SEATTLE, 129 tons plates, standpipe for Lake Youngs, to Chicago Bridge & Iron Works.

SACRAMENTO, CAL., 170 tons, crossing at Benham, to unnamed fabricator.

TIBURON, CAL., 100 tons, shop building for Northwestern Pacific, to Judson-Pacific Co.

OAKLAND, CAL., 150 tons, packing plant for Kings County Packing Co., to Herick Iron Works.

Structural Projects Pending

Inquiries for fabricated steel work include the following:

BOSTON, 1000 tons, Massachusetts General Hospital unit.

NEW BRITAIN, CONN., 500 tons, high school.

NEW YORK, 4200 tons, subway section 5, route 106; bids Dec. 21.

NEW YORK, 1000 tons, Scherhorn Laboratory for Columbia University at 118th Street and Amsterdam Avenue.

WARNER, N. J., 200 tons, building for American Cyanamid Co.

DETROIT, 350 tons, building for Motor Product Corporation; bids in.

WINDSOR, ONT., 2500 tons, Canadian approach to Detroit tunnel.

CLEVELAND, 4000 tons, grade elimination work in connection with new union station.

CINCINNATI, 600 tons, library at University of Cincinnati.

FORT WAYNE, IND., 200 tons, municipal power house.

CHICAGO, 1500 tons, MacChesney & Rubens-Wolbach Building; Holabird & Roche, architects.

MINNEAPOLIS, 6000 tons, bank building; Graham, Anderson, Probst & White, Chicago, architects.

KANSAS CITY SOUTHERN, 1200 tons, bridges.

Form \$150,000,000 Merger in Airplane Industry

The United Aircraft & Transport Co. has been organized as a holding company, which will acquire all the stock of the Pratt & Whitney Aircraft Corporation, Hartford, Conn.; the Chance Vought Corporation, Long Island City, N. Y., and the Boeing Airplane & Transport Corporation, Seattle, Wash. As one of the largest consolidations yet undertaken in the airplane industry, the new company will have a market value of approximately \$150,000,000 and will embrace the three major lines of the industry, namely, engine manufacture, plane construction and transportation.

More than half the common stock of the Pratt & Whitney company, which manufactures Wasp and Hornet air-cooled airplane motors, is owned by the Niles-Bement-Pond Co., New York, and stockholders in that company will receive two and one-eighth shares in the new corporation for each share of Niles-Bement-Pond. The Chance Vought Corporation manufactures Corsair observation planes, and its entire common stock will be acquired by exchange of stock in the new company. The preferred and common stock of the Boeing company, which is engaged in airplane manufacture and commercial air transportation on the Pacific Coast, will be exchanged share for share for the securities in the new corporation. The United Aircraft & Transport Co. will have an authorized

capitalization of 1,000,000 shares of 6 per cent preferred stock of \$50 par value and 2,500,000 shares of common stock.

All the subsidiary companies will be continued with their present managements and personnel, and with no changes in policy. William E. Boeing, president of the company bearing his name, will be chairman of the board of the new company; Frederick B. Rentschler, president of Pratt & Whitney, president; Chance Vought, vice-president, and Charles W. Deeds, secretary and treasurer. The directorate will include Philip G. Johnson, president of Boeing Air Transport, Inc., and the Boeing Airplane Co.; Charles F. Kettering, vice-president General Motors Corporation; Kenneth R. Kingsbury, president Standard Oil Co. of California; Charles K. Knickerbocker, vice-president Griffen Wheel Co.; William B. Mayo, chief engineer Ford Motor Co.; George J. Mead, vice-president and chief engineer Pratt & Whitney company, and Orville W. Tupper, secretary and treasurer Boeing Airplane & Transport Corporation.

Carnegie Bust Unveiled in Pan-American Union

WASHINGTON, Dec. 18.—A bronze bust of Andrew Carnegie, the gift of Mrs. Carnegie, was unveiled last Saturday in the Hall of the Americas of the Pan-American Union in the presence of the delegates of the American republics to the International Conference of American States on Conciliation and Arbitration, the diplomatic representatives of the republics of Latin America, members of the Cabinet and other high Government officials. The presentation address was made by Dr. Henry S. Pritchett, president of the Carnegie Foundation for the Advancement of Teaching. The bust was unveiled by the nine-year old granddaughter of Mr. Carnegie, Louise W. Miller, and was accepted on behalf of the governing board of the union by Frank B. Kellogg, Secretary of State, and chairman of the board. Mr. Carnegie contributed \$850,000 toward erection of the building, which is the permanent home for the organization representing the international union of the American republics.

Los Angeles Fabricators To Be Merged

The Consolidated Steel Corporation, Los Angeles, has been organized to take over and consolidate the Llewellyn Iron Works, the Baker Iron Works and the Union Iron Works, all of that city. All these companies are fabricators of structural steel buildings and other products and the Llewellyn and Baker organizations also manufacture elevators. The new company will be capitalized at \$6,000,000 and plans extensions and improvements to the three plants to coordinate manufacturing facilities.

This Issue in Brief

To reduce production costs, prepare an operation sheet before tooling up. This sheet should include every operation, both of production and inspection or gaging. Show them on a *single list*, in proper order. Thus attention is focused on the best sequence, on the number of inspections needed, on the best grouping of operations, and on their reduction to the least possible number.—Page 1575.

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Prices forecast by Dr. Haney. Early end to advance in pig iron market is indicated by statistics, says economist. Scrap barometer has not yet shown any sustained recovery. Finished steel prices appear to be about right in comparison with general level of commodity prices.—Page 1582.

* * *

Original cost of anti-friction bearings may well be less than that of plain bearings, says engineer. Having no expensive scraping-in labor, installation cost of the former is considerably lower.—Page 1563.

* * *

Carburizing costs are reduced and possibility of distortion is lessened by "single treating." Fine-grained steels may be treated considerably above the minimum temperature required for complete hardening, without coarsening. Thus both case and core may be satisfactorily refined by a single heating and quenching operation.—Page 1561.

* * *

Will tin plate find a competitor in aluminum-coated sheets? The latter is lighter than tin plate, according to Germans, who are reported to be planning for quantity output. Although aluminum is only half the price of tin, production costs may be higher, as the aluminum and the steel sheets must be sweated together.—Page 1555.

Oil-film bearing is the best type of plain bearing, says manufacturer. Though frictional coefficient is high at the moment of starting, later on it becomes much lower and approaches its best at the upper limits of speed. This type of bearing has great overload capacity.—Page 1566.

* * *

For economical manufacture, install a budget system. The three main tools—men, money and materials—must be coordinated. The budget enables an executive to measure the success of his efforts. It shows where improvements can be made.—Page 1567.

* * *

High uniformity of gage of rolled products is obtained by use of anti-friction bearings in rolling mills. Less adjustment of rolls is required and heat in the roll necks is considerably reduced, to a more or less fixed quantity.—Page 1565.

* * *

Magnetic testing offers a simple method of assurance that a particular product is substantially uniform throughout its length, says metallurgist, that it is without major discontinuities and that it has the average mechanical properties of other specimens which have been studied to destruction.—Page 1573.

* * *

Fixtures should be tied in with system of gaging. The same points or surfaces should be used for locating the work in the fixtures and for reference points in the gages. Only by so doing are the gages a direct check on the fixtures.—Page 1575.

* * *

Superior machining quality of coarse-grained steel is proved by production results of several large users who worked steels of known grain size, says metallurgist.—Page 1559.

If six or more men do your material-handling, you can cut your handling costs by using skid equipment. Cost will be reduced one-third, says truck manufacturer.—Page 1571.

* * *

Shock resistance of steel that is fine-grained after carburizing test is higher than coarse-grained, according to Izod impact test. But values for yield point, ultimate strength and elongation appear to be unaffected by grain size in the carburizing test, says metallurgist.—Page 1560.

* * *

"Fool proof" in heat treatment is a characteristic of fine-grained steels, says metallurgist. They are not so sensitive and therefore do not have to be worked within narrow limits of temperature and time.—Page 1561.

* * *

For high-temperature, high-pressure work, chrome-tungsten steel is well suited, investigators declare. A proportional limit of 100,000 lb. per sq. in. was secured, with little ductility, at 1000 deg. Fahr., after various heat treatments.—Page 1616.

* * *

Profits by successful methods of others and avoids errors discovered elsewhere, by utilizing business papers. Farm equipment manufacturer and head of United States Chamber of Commerce finds trade papers of great value in efficient operation of his business.—Page 1562.

* * *

Where lift trucks must operate in narrow aisles, arrange the skids in herringbone fashion. Then the truck need turn only a 45-deg. angle instead of 90 deg., and considerably narrower aisles can be utilized without inconvenience.—Page 1571.

A. I. FINDLEY
Editor

THE IRON AGE

W. W. MACON
Managing Editor

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Steel Far Outstrips Pig Iron

ITS surprisingly high production of ingots has already had much attention in comment on the various contributions of 1928 to the steel industry. Noteworthy in that connection is the unprecedented "spread" between pig iron production this year and steel ingot production. Estimating pig iron at 38,000,000 tons and steel ingots at 50,000,000 tons, we have steel exceeding pig iron by no less than 12,000,000 tons. In the past ten years the difference has ranged between 2,680,000 tons in 1919 and 7,564,000 tons in 1926. In 1927 it was about 7,200,000 tons.

All along it has been known that steel companies were making a much larger use of scrap in the production of open-hearth steel, but it will no doubt be a surprise even to those who have closely watched this development to find that the pig iron-ingot gap in 1928 has been nearly 4,500,000 tons more than in any other year.

It has been said for some years that pig iron is no longer a barometer of the steel trade, so large a place has scrap taken in steel-making, with the remarkable expansion of the open-hearth. Concurrently the increasing use of scrap in the blast furnace has destroyed the parallelism that was once fairly uniform between pig iron production and Lake Superior iron ore production, Lake ores being 80 to 85 per cent of the country's production of iron ore. Without now elaborating the subject, which has several points of interest to producers of iron ore and pig iron and to dealers in scrap, we append figures for 1928 and the year 1913, which is commonly taken in making comparisons with pre-war conditions. They represent production of Lake iron ore, and the country's output of pig iron and steel ingots in the two years:

	Lake Ore	Pig Iron	Steel Ingots
	Gross Tons	Gross Tons	Gross Tons
1913	52,377,362	30,966,152	30,280,130
1928	54,500,000	38,000,000	50,000,000

In 1913 steel ingot production was just overhauling pig iron production, which it passed in 1915. The figures are an impressive comment on much that was written 25 years ago of a doubling of pig iron production every ten years, and of an impending scarcity of Lake Superior ores in view of a ten-year doubling of demand for ore, to keep up with pig iron. With little more than a 2,000,000-ton gain in Lake ore output, there is a pig iron increase equivalent to 14,000,000 tons of ore, and an ingot increase equivalent to more than 22,000,000 tons of pig iron. The steel industry has been drawing increasingly on its above-ground stores of raw material, as each year sends a larger

tonnage to the discard. This and producers' "own" scrap now figure in our steel-making economy to an extent never dreamed of by the prophets of an approaching famine in Lake ores.

Criticism of Foreign Loans

SOME of those who criticize our loaning so much money abroad have aimed at a symptom instead of looking at the cause. The size of the item naturally attracts attention but mere bigness is not in itself adequate reason for attack except upon one line, the difficulty of repayment or of taking care of interest. With such criticism we are not here dealing. As to size, a fair measure is supplied by the summary in the last "Balance of International Payments of the United States," which make American long-term investments abroad 11½ to 13½ billion dollars at the end of 1927. For a convenient conception we may take 13 billions at the present time, with a billion-dollar range either way.

A familiar criticism argues that it is not good economics to export merchandise and get gold in return, because merchandise is useful, being productive of comfort and well being, while gold is not, and that it is still worse to secure not gold but merely promises to pay.

Granting this fully—what is there to do about it? The criticism is leveled squarely against our lending abroad, not against the conditions that conduce to our doing so. There is merely an inference, so delicate that the absurdity is not brought out, that if the capital were not exported it would be spent at home. Now, we do not export goods which can be sold at home and similarly no domestic demand for capital goes unsatisfied.

If something is wrong, it is that there is not so much domestic demand for capital as it would be well to have. The practical view is that already we have more investment in productive enterprise than we can employ by our own wants. We export the surplus product. If we had more investments there would be still more surplus product. One of these critics, writing in a highly esteemed medium, opines that we should be better off if we had built a score more hydroelectric plants or a million new homes. Well, the hydroelectric plants would displace coal miners and to be useful would result in still more goods to be worked off somewhere, and where else but in the export market? The million homes would have to be sold or rented, and to whom?

The fallacy lies in the assumption that capital exposed for sale will make its market. The market must

first be provided, to attract the capital. Our difficulty is that the present market is supplied. All told, we are well provided with coal mines, power plants, steel mills, automobile factories and the like. As we need more there is no difficulty in finding the capital. We do need additional markets for capital, just as new things, phonographs, automobiles, radio, have in recent years been supplying markets. Airplanes are now entering, but we are told television is unlikely to become commercial for several years. We could not force capital into the old things merely by keeping it from going abroad nor should we want to do so.

The answer is that we need still more research work, to find new things to make and to do, so that there will be perfectly new demand for goods and services, and capital will be called for to put the things into practice. The recent Carnegie Institute coal conference at Pittsburgh disclosed wide possibilities along several lines. We need new opportunities, not a forcing of growth in things that are already highly competitive.

Enlarging the Panama Canal

GROWING congestion of traffic through the Panama Canal has raised the question of enlarging the capacity for passing ships between the Caribbean and the Pacific. Though only fourteen years old, in point of service, the canal at Panama already is overtaking "de Lesseps's big ditch" at Suez in annual tonnage of ships making the transit, and 1927 showed more than four times the figures of eight years earlier. The Suez Canal, in that same interval, did not quite double its traffic but both canals made new high records last year.

	Panama Canal	Suez Canal
1927, tons	28,610,984	28,962,048
1923-27 average	25,310,916	25,924,881
1919	6,943,087	16,013,802

Much thought has been given to the subject of location. It is claimed by engineers that a third flight of locks, three at each end, would double the practical capacity of the present canal. This may well be so, though it would necessitate a better average flow of traffic and better control of transit peaks. But the element of strategy would seem to suggest that new facilities, if and when they must be provided, should be located at some distance from Panama. "All the eggs in one basket" may be perfectly satisfactory nineteen times out of twenty. On the twentieth, prudence might best be served by a separation of the eggs into two or more containers.

In the days when the present canal was but a dream—aside from the abandoned French workings—Mr. Bunau-Varilla effectively spiked the guns of those who advocated the Nicaragua route (Mr. Roosevelt, among them) by circularizing Congress, and others interested, with postage stamps of Nicaragua, showing active volcanoes where proponents declared there were none. Nevertheless, it appears to be thought that a duplicate route via Lake Nicaragua, now that we have the Panama Canal as an entity, might serve strategy and commerce equally well and properly distribute our eggs.

In any case, wherever the new facilities be built, certain details of dimensions, learned from more than a decade of operation at Panama, may well be considered. The locks in the present canal—twelve in all—are of uniform size: 1040 feet long and 110 feet width

of entrance. It is possible, often, when a small vessel is to be put through, to shorten the effective length by means of an intermediate set of lock gates, and thus to employ less water in locking the vessel up at one end and down at the other. But frequently conditions do not permit this, in which case it requires as much water to transit a motorboat as for a dreadnought, and in the dry season water already is at a premium.

As we now have facilities for ships as large as have ever been built, it would seem wise, in a new set of locks, to save much of a huge expense, both for construction and for operation, by building them much smaller than those at Panama. If they were 600 feet long and 80 feet broad they could handle nine-tenths of the ships now using the canal, and at a saving of perhaps one-half on the cost of locks duplicating those now in use.

At the same time there is a demand for a greater capacity, because certain ships now built and building tax the present locks to the utmost. Their width has hampered design in the Navy Department, where more than the 106 feet now considered maximum beam of ships, for safe passage, is wanted for the purpose of adding torpedo protection "bulges" to the sides of capital ships. It was at the insistence of the Navy that the width of the present locks was made 110 feet, in place of the 100 feet of the earlier design. When the Kaiser Wilhelm or Kiel Canal was enlarged, shortly before the World War, the narrowest passage was made 131 feet. Transatlantic liners now being built will be 1000 feet long. Such mammoth ships may not soon enter into Pacific trade, or, more particularly, into trans-Isthmian routes. But we are planning for the future. And our experience of many years tells us that considerable expansion may be expected. The largest ship sent through the Suez Canal in 1870 was of 4414 tons; in 1927, nearly 27,000 tons.

Hence a flight of large locks, measuring perhaps 130 feet wide and 1200 feet long, would seem to be indicated. Putting this flight alongside our suggested smaller one—80 by 600 feet—would supplement the Panama Canal in a dual sense. It would permit passage of ships much larger than can now use the canal; it would permit passage at much reduced cost of such ships as constitute today, and will tomorrow, the great bulk of all that make the transit.

Integration in Non-Ferrous Metals

AN increasing tendency is seen among our metal-producing companies to carry forward the integration of their business into the manufacturing end, so that the copper, lead and zinc from their refineries may go largely to their own factories. Of course this condition has previously existed to a considerable extent. The Steel Corporation for many years has been consuming all of its own spelter for its own galvanizing, and the Matthiesen & Hegeler Zinc Co. and the Illinois Zinc Co. have used the major part of their product for their own rolling. The New Jersey Zinc Co. has become more and more a manufacturer of products of diverse character. More recently Anaconda acquired extensive copper and brass manufacturing interests. The American Smelting & Refining Co. and Phelps, Dodge & Co. have been doing likewise.

The manufacture of brass in the United States amounts to about 540,000 tons a year, whereof about

240,000 tons is made by the division classified as founders, who produce castings; and the other 300,000 tons by the division described as fabricators, who make rods, wire, sheet, tubes, etc. These are the largest and most profitable concerns. There are only 16 of them. That is to say, about 300,000 tons of brass is made annually by sixteen fabricators, while the other 240,000 tons is made by founders, large and small, whose number runs to more than 1000.

This gives some idea of the market for high-grade zinc. The brass founders do not use any of that. The brass fabricators use it to a considerable extent, but their practice in this respect is not uniform. Probably the American Brass Co. uses a larger proportion than any other concern.

Phelps, Dodge & Co. recently acquired an interest in the Bridgeport and Bristol brass companies. The American Smelting & Refining Co. has just taken a large interest in the Republic Brass Corporation that has been organized to take over the Dallas, Michigan, Rome and Taunton-New Bedford plants.

In the present alignment Anaconda is interested in about 42 per cent of the brass fabrication, the American Smelting & Refining Co. in about 15 per cent and Phelps, Dodge & Co. in about 7.5 per cent. The large independents are Scovill and Chase, which together do about 28 per cent of the business. Scarcely any of these fabricators limit themselves to brass. The same concerns do practically all of the fabrication of copper into rods, wire, plates, sheet, tubes, etc.

In lead the American Smelting & Refining Co. has an important interest in the recently formed General Cable Co. that does a large part of the manufacture of lead covered cables.

On the other hand some of the manufacturing companies have integrated themselves backward. Thus both the National Lead Co. and the Eagle Picher Lead Co. produce a considerable portion of their own lead.

A few large consumers have neither their own production nor manufacture, but buy directly the refined metals they need and have them manufactured on toll. The General Electric Co. and the Electric Storage Battery Co. are the most important examples of this practice.



That Airplane Industry

AIR transport by heavier-than-air machines has completed its first quarter century and speculation is now rife as to its future. Lurid pictures have been painted, as usual, for the commonplace would not satisfy. It remains that airplane manufacture is now getting under way in this country at a tremendous rate, and the succeeding years will surely show large consumption of iron, steel and other metals and further stimulate metallurgical investigations. While it may doubtless be true, as those best positioned to prophesy say, that the airplanes of a few years hence would not now be recognized, no one fails to acknowledge dependence, past and future, on researches among special metals and alloys.

The anniversary of the discoveries made by the Wright brothers at Kitty Hawk, N. C., twenty-five years ago, is still so recent that one may recall readily the ponderous tomes published in Europe, particularly in France, discussing seriously the scientific and engineer-

ing basis of flying, but at the same time always bringing the easy smile in general engineering circles. Yet in only a matter of a few months it will be clear to the man on the street that we already have a new and lusty industry.

Funds for Future Pensions

THE cost of an industrial pension system should be provided for during the productive years of the men who are to benefit from it after their years of usefulness have ended. According to Ingalls Kimball, director of group annuities of the Metropolitan Life Insurance Co., it should be considered in the same light as depreciation or any other item of overhead or operating expense.

This, however, is not the common practice. One reason is that almost every pension plan contains a provision permitting its alteration or withdrawal, no legal liability being assumed, no contract existing. Another reason in many cases is that the growth of industry has been so rapid that until within recent years pension payments (arising, of course, out of the very limited number of employees remaining from the relatively few who made up the early working force) have been so small, when compared to the active payroll, that they have scarcely seemed worth serious consideration.

Those strong companies that have been operating a pension system through good years and bad for a considerable period appear to be satisfied with results attained, without troubling with established funds. Their pensions are paid as a supplementary payroll, and enter into current costs and into prices charged for products. But a company whose forces are growing apace, planning to establish a pension system, might very well heed Mr. Kimball's argument. Conditions are changing.

It is well recognized as a not inconceivable eventuality that industrial pensions will become as generally compulsory as workmen's compensation and so be a fixed charge. A certain percentage of the working forces of today will be the pensioners of a future not very far distant, and the sum total of the benefits paid them will constitute an item by no means negligible.

Mr. Kimball in fixing the basis of his theory said: "Last year the Pennsylvania Railroad paid to retired employees approximately \$6,000,000; yet from no one of these pensioned employees did the railroad receive a penny's worth of value. This \$6,000,000 when charged, as under the Interstate Commerce regulations it must be, to operating cost, increased the cost of transportation without improving it. It was paid because of service rendered to the railroad during the active years of the former employees who are now pensioners. It was paid, in other words, as partial recompense for work done—for man power expended—years ago." Yet the railroad would hardly enter in its operating cost of today an item of \$6,000,000 paid this year for coal burned or electric power consumed during years that have gone by.

Apparently there is ample experience upon which to base an annual charge for pension account. Industries have carried on these systems for sufficiently

long periods to determine what percentage of workers may be expected to fulfill requirements, such as length of service at the given retirement age, say 65 years. Actuarial figures are available as to what the life expectancy may be among those who become pensioners.

These problems can be solved with a close approach to accuracy. With a predetermined pension rate, based perhaps on previous earnings and length of service, it does not seem a difficult task to determine the annual charge to pension account.

Italy Lacks Adequate Natural Resources

Fascist Rule Born of Chaotic Conditions—Continuance Depends on Success in Solving Country's Economic Problem

BY EDWIN C. ECKEL*

SOMEWHERE IN ITALY, Nov. 11.—It is the tenth anniversary of Armistice Day, and it is also the King's birthday, so all Italy is in holiday. And since Oct. 28 it has been the seventh year of Fascist rule in Italy.

Both in France and England the government has been, for some years past, in extremely conservative hands; and the best opinion seems to be that at the next general elections there will be little shift in control in either country. Yet it must be borne in mind that in each case the control is in the hands of what is really a minority group, carried into power at the moment by popular fear of worse things from its opponents. In England the Labor Party casts the largest single block of votes and can undoubtedly come into power whenever it is united on its own policies, provided those policies are not so extremely socialistic as to alarm all the other classes of the population. In France the largest single party is also one that is much more radical than the group now in power, and it too could easily take over the government under corresponding conditions. The present very conservative administrations in both countries owe their positions to two factors—the flirtations of the extreme Labor people with red Moscow and the rapid fall of the franc and the pound some years ago. Everyone in either France or England who had any money, or hoped ever to have any, was brought to back extreme conservatism as a protest against those two things.

Fascism a Reaction from Extreme Conditions

In Italy conditions had become far worse and the resulting reaction went past conservative parliamentary rule into the pure absolutism of Fascism.

After the war Italy had drifted rapidly toward what was practically anarchy. The old political "leaders" had shown themselves entirely incapable of leadership in any real sense, and they simply bowed before the socialistic storm that broke out in northern Italy. Strike followed strike; factory after factory was seized by its laborers with the idea of operating a Soviet or exercising trade-union control of industry—and still the politicians at Rome did nothing. Another year or so and Italy might easily have surpassed Russia in the adoption of Red doctrines.

It was only after this chaotic condition had continued for four years that the Fascist reaction against it broke out suddenly and triumphed with equal suddenness. It has now lasted for six years and it still gives the country a strong and efficient government. And that, after all, is what Italy needed most from 1914 to 1922.

The Fascists' régime is a very strong rule, and it has the defects, as well as the advantages, of that strength. It is nationalist to the core, it is chauvinist at times, it may at times be looked upon as a menace by neighboring countries. But from the purely Italian point of view it has succeeded in making the Italians respect themselves, and by

consequence has forced other countries to respect the Italians. That, as I say, is from the purely Italian viewpoint; but, after all, any government must be judged first of all in its effects upon its own people.

In accomplishing all this it has been necessary to suppress political action, speech and press. In 1920 there were 11 political parties in the legislature at Rome, and no one could ever get agreement on any subject whatever. Today there is only one political party and its program is carried out without opposition or discussion.

The Fascist rule is based upon certain ideals as to state unity. Its support was primarily derived from the soldiers who had fought for Italy and who returned to find the politicians looking on while the socialists prepared to sovietize the country. With all this came also support from the bourgeoisie—the middle classes and the industrialists, who were unfavorable to a Soviet régime. Fascism offered a preferable alternative, and it was accepted by these powerful classes.

It will be seen that I agree entirely with all of my Italian friends who say that Fascism was born of cold necessity, and that it has given them a clean, strong and efficient government, for the first time in many years.

Italy's Poverty Hardest Fascist Problem

The past and present of Fascism are clear enough; its future is still not clear. And that, not judging from political theories, but from economic facts. Italy is a poor country, not only financially, but as regards natural resources. There is no coal whatever in Italy; there is practically no petroleum; there are no lead, zinc or copper mines; there is only one important iron mine, whose reserves may be figured in millions of tons. As against these deficiencies there are water-power, sulphur and some 10 or 20 million tons of aluminum ore.

The real Fascist problem is one of making it possible for a large population to live in Italy. That may be done by development of water-power and of industries using the power produced. And a solution of this type, if practicable, would mean that Fascism had proved its worth and might remain in power indefinitely. Other than that possible solution there are only two alternatives: to decrease the population by emigration or deliberate reduction in the birth rate, or to acquire new grain or coal lands by settlement, treaty or war.

My data on Italian labor conditions are too incomplete to be taken too seriously. Ten days in a country does not give a very clear idea of average conditions. But at one large group of mills the average pay of common labor is now 18 lire per 8-hr. day, or about 95c. a day. At other mills and factories I find rates from common to skilled labor ranging from 2 to 3 lire an hour, equivalent to 85c. to \$1.20 a day. These are all in the Northern industrial district and probably represent well over the average working income in the country at large.

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Iron and Steel Markets

Steel Output Gains at Chicago

Increased Production in West Offsets Declines Elsewhere—
Another Advance in Scrap—New Prices
on Plates and Shapes in East

DESPITE holiday and inventory considerations, steel ingot output for the country at large is more than holding its own, although declines are reported at some plants.

Specifying, in most districts, has been heavy in sheets, tin plate and wire products and cautious in lines where a price incentive has been lacking, while new business has been in unimpressive volume. At Chicago, however, total specifications are second only to those of the first week of January, and sales, influenced by orders for rails and track supplies, are well up to the average of the past six weeks.

Pig iron demand has diminished with the approach of the year-end, and price weakness has appeared. Valley foundry iron has declined 50c. a ton to \$17.50, furnace, and a softer market has developed along the Eastern seaboard. A Tennessee furnace has withdrawn a recent advance of 50c. a ton.

Scrap, on the other hand, shows further strength. Heavy melting steel at Pittsburgh, now \$18 a ton, has recovered in two weeks the peak position it held in October.

Sectional contrasts are evident in steel output. Operations of a leading Buffalo district producer have declined to 60 per cent of capacity; but the average for the Greater Pittsburgh district is unchanged at 80 per cent, and production at Chicago has risen to 85 per cent, compared with 83 per cent a week ago. Open-hearth operations in Alabama are at the highest rate of the year. The average output of Steel Corporation subsidiaries, estimated at 85 per cent, compares with a recent rate of 84 per cent.

The production situation also emphasizes contrasts among products. Heavy releases of sheet tonnage prior to the mid-month deadline on contract specifications have given producers backlogs that will carry them well into January. Mills are operating virtually full and Christmas shutdowns will probably be limited to two days. Tin plate output continues at 87 per cent and also promises to carry through the month with a minimum interruption. Rail output is at an ascending rate, as a result of specifications against 1929 contracts.

In wire products, releases against contracts expiring Jan. 1 have been stimulated by the recent advance in prices. Since these specifications will be accepted until the end of the month, a test of the new quotations is necessarily deferred.

The market situation in bars, plates and shapes is quieter in most districts. Many buyers did not specify fully against their fourth quarter contracts and, not being apprehensive regarding prices, are in no haste to

commit themselves for the next quarter. At Chicago, however, bar bookings for the week exceeded shipments. A feature of the Western market is the increasing demand from the farm equipment industry, which has temporarily forged ahead of automobile manufacturers as the largest user of bars.

First quarter prices on bars, plates and shapes at Eastern mill basing points, announced by the Bethlehem Steel Co., include minimum quotations on the last two products that are \$1 a ton lower than had been commonly conceded as representative of the market. The move is interpreted as an effort to stabilize prices named to the largest buyers by substituting a single open quotation for varying preferentials. To compete for Eastern business of this category mills using a Pittsburgh base will have to quote 1.80c. to 1.85c.

A gas line from Baxter Basin, Wyo., to Ogden, Utah, requiring 33,000 tons of plates, has been placed with a Milwaukee fabricator. That company is also reported to have taken an order for 200 miles of 16-in. pipe for the El Paso Natural Gas Co. Line pipe business placed this year is estimated at close to 1,000,000 tons.

Rail bookings have been augmented by a 15,000-ton order from a Western road. Although fewer roads have bought than had placed contracts up to this time in 1927, mills look for no decline in total tonnage booked when the rail buying movement is completed.

Fabricated steel orders for November, computed at 243,750 tons, were 3 per cent above the total for the same month last year, but were the smallest, except for October, since April.

Although sales gained, there was a slowing down in both production and shipments of steel sheets in November, according to reports compiled by independent mills.

Ohio River shipments of steel in November, at 137,000 tons, established a new monthly record. The total for the 11 months of this year, at 1,162,000 tons, exceeds by 150,000 tons the combined movement for the two previous years. Eastbound shipments of pig iron on the New York State barge canal also reached a new high, totaling 122,500 tons for the 1928 navigation season.

Iron ore receipts at Lake Erie ports this year totaled 36,959,000 tons, a gain of 406,000 tons over 1927. A much larger increase was shown in shipments to other than Lake Erie ports—mainly to the Chicago district—for which the total was 16,490,000 tons, or 2,447,000 tons more than in the previous year.

THE IRON AGE composite price for pig iron has declined from \$18.59 to \$18.46 a ton, its first drop since July. The finished steel composite remains unchanged at 2.391c. a lb.

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics
At Date, One Week, One Month, and One Year Previous

Pig Iron, Per Gross Ton:	Dec. 18, 1928	Dec. 11, 1928	Nov. 20, 1928	Dec. 20, 1927
No. 2 foundry, Philadelphia.....	\$21.26	\$21.26	\$21.26	\$19.76
No. 2, Valley furnace.....	17.50	18.00	17.50	17.25
No. 2, Southern, Cin'ti.....	20.19	20.19	20.19	19.69
No. 2, Birmingham.....	16.50	16.50	16.50	16.00
No. 2 foundry, Chicago*.....	20.00	20.00	20.00	18.50
Basic, del'd eastern Pa.....	20.25	20.25	19.75	19.50
Basic, Valley furnace.....	17.50	17.50	17.50	17.00
Valley Bessemer, del'd P'gh....	20.01	20.01	20.01	19.26
Malleable, Chicago*.....	20.00	20.00	20.00	18.50
Malleable, Valley.....	18.25	18.25	18.25	17.50
Gray forge, Pittsburgh.....	18.76	19.26	18.76	18.51
L. S. charcoal, Chicago.....	27.04	27.04	27.04	27.04
Ferromanganese, furnace.....	105.00	105.00	105.00	100.00

Rails, Billets, Etc., Per Gross Ton:	Dec. 18, 1928	Dec. 11, 1928	Nov. 20, 1928	Dec. 20, 1927
O.-h. rails, heavy, at mill.....	\$43.00	\$43.00	\$43.00	\$43.00
Light rails at mill.....	36.00	36.00	36.00	36.00
Bess. billets, Pittsburgh.....	33.00	33.00	33.00	33.00
O.-h. billets, Pittsburgh.....	33.00	33.00	33.00	33.00
O.-h. sheet bars, P'gh.....	33.00	33.00	33.00	34.00
Forging billets, P'gh.....	38.00	38.00	38.00	38.00
O.-h. billets, Phila.....	38.30	38.30	38.30	38.30
Wire rods, Pittsburgh.....	42.00	42.00	42.00	40.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb.....	1.90	1.90	1.90	1.80

Finished Iron and Steel, Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Iron bars, Philadelphia.....	2.12	2.12	2.12	2.12
Iron bars, Chicago.....	2.00	2.00	2.00	1.90
Steel bars, Pittsburgh.....	1.90	1.90	1.95	1.80
Steel bars, Chicago.....	2.00	2.00	2.00	1.90
Steel bars, New York.....	2.24	2.24	2.29	2.14
Tank plates, Pittsburgh.....	1.90	1.90	1.90	1.80
Tank plates, Chicago.....	2.00	2.00	2.00	1.90
Tank plates, New York.....	2.17½	2.22½	2.22½	2.12½
Beams, Pittsburgh.....	1.90	1.90	1.90	1.80
Beams, Chicago.....	2.00	2.00	2.00	1.90
Beams, New York.....	2.14½	2.19½	2.19½	2.09½
Steel hoops, Pittsburgh.....	2.10	2.10	2.20	

*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our market reports on other pages.

Sheets, Nails and Wire, Per Lb. to Large Buyers:	Dec. 18, 1928	Dec. 11, 1928	Nov. 20, 1928	Dec. 20, 1927
	Cents	Cents	Cents	Cents
Sheets, black, No. 24, P'gh....	2.85	2.85	2.75	2.80
Sheets, black, No. 24, Chicago				
dist. mill.....	2.95	2.95	2.85	2.90
Sheets, galv., No. 24, P'gh....	3.60	3.60	3.50	3.65
Sheets, galv., No. 24, Chicago				
dist. mill.....	3.70	3.70	3.60	3.70
Sheets, blue, 9 & 10, P'gh....	2.10	2.10	2.00	2.10
Sheets, blue, 9 & 10, Chicago				
dist. mill.....	2.20	2.20	2.10	2.15
Wire nails, Pittsburgh.....	2.65	2.65	2.55	2.50
Wire nails, Chicago dist. mill..	2.70	2.70	2.60	2.55
Plain wire, Pittsburgh.....	2.50	2.50	2.40	2.40
Plain wire, Chicago dist. mill..	2.55	2.55	2.45	2.45
Barbed wire, galv., Pittsburgh.	3.30	3.30	3.20	3.20
Barbed wire, galv., Chicago				
dist. mill.....	3.35	3.35	3.25	3.25
Tin plate, 100 lb. box, P'gh....	5.25	\$5.25	\$5.25	\$5.25

Old Material, Per Gross Ton:	Dec. 18, 1928	Dec. 11, 1928	Nov. 20, 1928	Dec. 20, 1927
Heavy melting steel, P'gh.....	\$18.00	\$17.75	\$17.00	\$15.00
Heavy melting steel, Phila.....	15.00	15.00	15.50	13.50
Heavy melting steel, Ch'go.....	14.50	14.50	14.50	12.25
Carwheels, Chicago.....	14.00	14.25	14.25	13.50
Carwheels, Philadelphia.....	16.50	16.50	16.50	15.50
No. 1 cast, Pittsburgh.....	14.50	14.50	14.50	14.50
No. 1 cast, Philadelphia.....	16.25	16.25	16.25	16.00
No. 1 cast, Ch'go (net ton).....	15.50	15.50	15.50	14.00
No. 1 RR. wrot., Phila.....	15.50	15.50	15.50	15.25
No. 1 RR. wrot., Ch'go (net)...	13.25	13.25	13.00	10.50

Coke, Connellsville, Per Net Ton at Oven:	Dec. 18, 1928	Dec. 11, 1928	Nov. 20, 1928	Dec. 20, 1927
Furnace coke, prompt.....	\$2.75	\$2.75	\$2.85	\$2.75
Foundry coke, prompt.....	3.75	3.75	3.75	3.75

Metals, Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Lake copper, New York.....	16.12½	16.12½	16.12½	14.25
Electrolytic copper, refinery...	15.75	15.75	15.75	13.75
Zinc, St. Louis.....	6.35	6.35	6.25	5.67½
Zinc, New York.....	6.70	6.70	6.60	6.02½
Lead, St. Louis.....	6.35	6.35	6.17½	6.30
Lead, New York.....	6.50	6.50	6.35	6.50
Tin (Straits), New York.....	49.62½	49.50	51.12½	58.12½
Antimony (Asiatic), N. Y.....	9.87½	9.62½	10.25	11.25

Pittsburgh

Heavy Sheet Specifications—Steel Business Generally Is Good for December—Foundry Iron Off 50c.

PITTSBURGH, Dec. 18.—While the close proximity of the holiday season occasions some slowing up of demand, the flow of specifications as a whole is not materially lighter than it has been, and it has been really heavy in sheets as a result of the mid-December deadline on the acceptance of specifications on fourth quarter contracts. At least two manufacturers lately have found it necessary to work an extra turn on some of their sheet mills, and the problem now is whether they can limit in mill operations the observance of Christmas to merely the day before and the holiday itself. Tin plate manufacturers also have sufficient business to want to suspend mill operations only on next Monday and Tuesday.

There has been no decrease in ingot production in this and nearby districts, and, though next week may see some recession, it is commonly expected that December will round out a succession of good months in output.

Rail mill engagement is increasing, but, as an offset, pipe mills show a tendency to a declining operation. Two good-sized line pipe orders went West recently. Some of the large pipe furnaces are down as a result of completion of old orders.

There is much interest in the price announcement of the leading Eastern producer of bars, plates and shapes, especially as it means that on Eastern business local mills will now have to

do 1.80c. to 1.85c., Pittsburgh, on plates and shapes to compete with Eastern mills.

The test of the new wire schedule is somewhat delayed by the fact that makers still owe considerable tonnages to distributors on old contracts.

The inside prices on hot-rolled strips are not being strictly confined to the so-called round tonnage buyers, and there are reports that some makers of cold-rolled strips of lim-

ited capacity have found it necessary to go under the regular price of 2.85c., base, to secure orders. In the latter case, however, there is no general recognition of the concession, since those making it account for so little of the total production.

Some large users of bars seem to think they should be given preferential price treatment when their orders are of sufficient size to enable the mills to cut producing costs.

The scrap market has a very strong undertone and presents some rather unusual price movements and relationships. A sale of a round tonnage of heavy breakable cast scrap to a melter that has used it very infrequently in the past was at \$2 or more a ton above the last previous sale of importance. As much as \$19 has been paid for compressed sheets by a melter using no other grade to any considerable extent; that grade is very scarce and at \$19 is at a premium of 50c. a ton over the highest price actually paid in this district for heavy melting steel.

A reappearance of \$17.50, Valley furnace, for No. 2 foundry iron, a drop of 50c. a ton, stands out in a dull and uninteresting pig iron market. This came on a tonnage that has

presented the only real test prices have had recently.

Pig Iron.—A price of \$17.50, Valley furnace, again has appeared on No. 2 foundry iron, one fair-sized tonnage for shipment over the first quarter of next year having been placed at that price. The small-lot market remains quotable at \$18 for this grade. It had been observed in these reports recently that the test of large inquiry was lacking. Business in iron generally is slow, as if usually is at this time of the year. Some producers report a slackening of specifications on old orders, owing to the approach of the holiday period, but generally shipments are holding up well, and most producers find the outward movement exceeding production. There is little interest in the steel-making grades, although one melter has taken prices on a round lot of basic iron. This inquiry does not appear to have produced lower prices than \$17.50, Valley furnace. That this grade should show some resistance to pressure is probably due to the fact that the scrap market lately has shown considerable strength and with it is the possibility that steel makers will be obliged to use more pig iron and therefore will have less for market. Struthers furnace, Struthers, Ohio, went into blast Sunday night.

Prices per gross ton, f.o.b. Valley furnace:

Basic	\$17.50
Bessemer	\$18.25 to 18.50
Gray forge	17.00 to 17.50
No. 2 foundry	17.50 to 18.00
No. 3 foundry	17.00 to 17.50
Malleable	18.25 to 18.50
Low phos., copper free....	26.50 to 27.00

Freight rate to Pittsburgh or Cleveland district, \$1.76.

Semi-Finished Steel.—Shipments of billets, slabs and sheet bars still are large on fourth quarter contracts, but no considerable amount of first quarter tonnage yet has reached makers' books, nor have negotiations for that period assumed much activity. Since an advance of \$1 a ton over this quarter's price is sought for the next quarter on sheet bars, detached mills are specifying on existing arrangements, especially as it will be well past the turn of January before fourth quarter sheet business can be

completed. Fairly good business is reported in wire rods, and no great trouble attends the efforts to line up buyers for their first quarter requirements. Rods extras have been revised, but the only changes are in the carbon range limits.

Bars, Plates and Shapes.—Buyers are specifying steadily and, while demands provide no tax either on the productive capacity or on the ability of the mills to make prompt deliveries, they are sufficient to sustain the recent rate of operations. Contracting for the first quarter also is steady rather than active, buyers generally taking the position that as higher prices are not likely in the near future there is no need of haste about commitments. In bars, some large users talk of seeking more favorable price terms; on orders for 200 or 300 tons of a size, for one rolling and one shipment, they feel entitled to some of the saving that such orders permit in rolling costs. Plate business locally suffers from light railroad car and river barge business, and, while pipe line business is heavy, it is going largely to a central Western maker, and local mills are not much benefited. Structural awards to local shops are few and small, and there are no outstanding pending projects in this area.

Rails and Track Supplies.—Operations of the local standard-section rail mill are expanding, with the specifying of 1929 rails for January delivery. Local makers of spikes, track bolts and tie plates have the promise of a share in the requirements of the New York Central Lines, but there has been no formal distribution of orders. This is the most recent inquiry of a size to test prices, and it is said that it brought out no deviations from the regular quotations. Suggestions of lower prices for tie plates from the West find no verification here.

Wire Products.—Mills still owe customers considerable quantities of nails carrying the prices ruling prior to Dec. 5. The effect of the recent advance has been to stimulate specifications. In a general way, no great re-

sistance to the new prices is being encountered, and first quarter contracting is said to be fairly heavy. Some jobbers, who, on account of the size of their purchases, are included in the class getting only 5c. per 100 lb. under the published schedule, do not like the new sales plan and are protesting.

Tubular Goods.—Line pipe and seamless oil country pipe still are active, but good demand for the former is not helping Pittsburgh district mills, as the 287-mile line of 14-in., 16-in. and 18-in. pipe for the Western Public Service Corporation gas line to run from Wyoming to Salt Lake City and Ogden, Utah, went to the A. O. Smith Corporation, Milwaukee, and that interest also is said to have taken 200 miles of 16-in. for the El Paso Natural Gas Co. line from Lea County, N. M., to El Paso. Several of the large pipe furnaces of makers in this and nearby districts are down for want of orders, while the Milwaukee producer is said to have 1600 miles of various sizes on its books. Lapwelded oil country pipe is very dull, but there is a fairly good demand for butt welded pipe for the time of year. In the new boiler tube price schedule, announced in THE IRON AGE last week, manufacturers have made a slight amendment in discounts on lots of less than 10,000 lb. of charcoal iron tubes, on which the basing discount is lowered two points, with no preferential discount allowed. In the seamless tube price list, against which the new discounts on charcoal iron and lapwelded steel tubes apply, the Birmingham wire gage on 2¼-in. tubes has been changed to No. 12 gage, or 0.109 in., and the price for standard thickness is 29c. per ft., 31c. for one extra wire gage, 35c. for two extra wire gages, 38c. for three extra wire gages and 42c. for four extra wire gages.

Sheets.—Not a little sheet business was driven in by the fact that last Saturday was the closing date on specifications on four quarter contracts, and prices for the next quarter are \$2 a ton above those ruling on

THE IRON AGE Composite Prices

Finished Steel

Dec. 18, 1928, 2.391c. a lb.

One week ago.....	2.391c.
One month ago.....	2.369c.
One year ago.....	2.314c.
10-year pre-war average.....	1.689c.

Based on steel bars, beams, tank plates, wire, rails, black pipe and black sheets. These products make 87 per cent of the United States output of finished steel.

	High		Low	
1928	2.391c.,	Dec. 11:	2.314c.,	Jan. 3
1927	2.453c.,	Jan. 4:	2.293c.,	Oct. 25
1926	2.453c.,	Jan. 5:	2.403c.,	May 18
1925	2.560c.,	Jan. 6:	2.396c.,	Aug. 18
1924	2.789c.,	Jan. 15:	2.460c.,	Oct. 14
1923	2.824c.,	Apr. 24:	2.446c.,	Jan. 2

Pig Iron

Dec. 18, 1928, \$18.46 a Gross Ton

One week ago.....	\$18.59
One month ago.....	18.54
One year ago.....	17.54
10-year pre-war average.....	15.72

Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.

	High		Low	
1928	\$18.59,	Nov. 27:	\$17.04,	July 24
1927	19.71,	Jan. 4:	17.54,	Nov. 1
1926	21.54,	Jan. 5:	19.46,	July 13
1925	22.50,	Jan. 13:	18.96,	July 7
1924	22.88,	Feb. 26:	19.21,	Nov. 3
1923	30.86,	Mar. 20:	20.77,	Nov. 20

this quarter's commitments. As a result, mills are well supplied with orders in almost all finishes that will carry them well into next month, but a good many buyers, by the same token, will secure no small part of next month's requirements without being obliged to pay any advance in prices. It is not helpful to the early 1929 market that a good deal of roofing material lately released will hardly enter consumption until along in February. Mill operations are approximately full this week, and except for such recession as is occasioned by the observance of Christmas, there will be full operation next week. Manufacturers generally plan to suspend at noon the Saturday before Christmas and will not resume until the second turn on Wednesday following the holiday.

Tin Plate.—Complete suspension of a Chicago district independent tin plate plant is planned for all of next week, but generally manufacturers are so well supplied with business that a strong effort will be made to confine observance of Christmas in the mills to Monday and Tuesday. The course of the Chicago mill is dictated by a belief that it will be hard to keep the crews intact during the holiday week. Spot demands still are good and specifications for early 1929 requirements are pouring in freely. This week's mill engagement is about 87 per cent of capacity.

Co'd-Finished Steel Bars and Shafting.—Real activity is lacking, although specifications are being made steadily and no resistance is encountered in getting consumers to sign up for their first quarter needs. Present automobile production is moderate, and early 1929 plans wait on the results of the showing of new models.

Old Material.—Surface activity is not great, but under the surface the market is boiling as a result of the

growing realization that supplies of the steel works grades are none too large and a belief that between now and the end of the year steel makers will have to buy. Heavy melting steel has been sold at \$18.50 in this district, and none seems available at less than \$18, while up to \$19 has been paid by one consumer for compressed sheets for shipment from the Detroit district. There is sympathetic strength in railroad specialties and in low phosphorus scrap. A sale of 10,000 tons of heavy breakable cast scrap to a Pittsburgh district steel company is noted at \$15.50. The last previous sale of this grade of any importance was at \$13.

Prices per gross ton delivered consumers' yards in Pittsburgh and points taking the Pittsburgh district freight rate:

Basic Open-Hearth Grades:	
Heavy melting steel.....	\$17.50 to \$18.50
Scrap rails	18.00 to 18.50
Compressed sheet steel....	18.00 to 19.00
Bundled sheets, sides and ends	17.00 to 17.50
Cast iron carwheels.....	15.00 to 15.50
Sheet bar crops, ordinary..	18.50 to 19.00
Heavy breakable cast.....	15.00 to 15.50
No. 2 railroad wrought....	18.00 to 19.00
Hvy. steel axle turnings...	16.00 to 16.50
Machine shop turnings....	11.50 to 12.00

Acid Open-Hearth Grades:	
Railr. knuckles and couplers	19.00 to 19.50
Railr. coil and leaf springs	19.00 to 19.50
Rolled steel wheels.....	19.00 to 19.50
Low phos. billet and bloom ends	21.00 to 21.50
Low phos. mill plates.....	19.50 to 20.00
Low phos. light grade....	18.50 to 19.00
Low phos. sheet bar crops	19.50 to 20.00
Heavy steel axle turnings..	16.00 to 16.50

Electric Furnace Grades:	
Low phos. punchings.....	19.00 to 19.50
Hvy. steel axle turnings..	16.00 to 16.50

Blast Furnace Grades:	
Short shoveling steel turnings	12.00 to 12.50
Short mixed borings and turnings	12.00 to 12.50
Cast iron borings.....	12.00 to 12.50

Rolling Mill Grades:	
Steel car axles.....	20.00 to 21.00
No. 1 railroad wrought....	13.50 to 14.00
Sheet bar crops.....	19.00 to 19.50

Cupola Grades:	
No. 1 cast.....	14.50 to 15.00
Rails 3 ft. and under.....	19.50 to 20.00

Hot-Rolled Flats.—Hot-rolled strips still are quoted at the recent price range, but while it is said that no further concessions have been made to large consumers, it is admitted that the inside prices are extending to the small tonnage buyers. Specifications are fairly steady on old orders, and a fair amount of first quarter business has been written, although some of the very large users are yet to close for their requirements.

Cold-Rolled Strips.—Makers generally are holding firmly to 2.85c., base, although a few deviations from that price are said to have been made by producers whose capacity is limited. Specifications are coming in fairly freely and much first quarter business has been written at the full quotations.

Coke and Coal.—Two blast furnaces, expected to go in this month, have not been lighted and this has left the spot supply of furnace coke a little too large for requirements.

Prices still are easy, although producers have not been obliged to go below \$2.75 per net ton at ovens. First quarter coke for a Buffalo furnace and a central Pennsylvania furnace was placed recently at prices ranging from \$2.80 to \$2.85. Foundries generally are under cover for their coke requirements for the first quarter and half of next year. Production of slack coal has decreased and now is more in line with demand, with the result that prices are slightly firmer; the market otherwise is as dull and weak as ever.

Urges Free Clinic as Safe-guard to Workers' Health

Edward N. Hurley, chairman of the board Electric Household Utilities Corporation, Chicago, has offered to assist in raising funds for the construction of a community clinic on McKinlock Campus of Northwestern University, Chicago, if that institution will provide the site. In a letter to Walter Dill Scott, president of the university, Mr. Hurley states that business losses from technical and managerial incompetence are of minor importance compared with the loss from preventable bodily defects and breakdowns among the nation's workers. The present annual loss of time caused by preventable illness of 42,000,000 workers employed in gainful occupation, he said, is 350,000,000 hours.

The plan contemplates giving periodical physical examinations free to those without means, but fees would be charged those who can afford them.

Railroad Traffic in First Nine Months

Freight traffic in the first three-quarters of 1928 reached 349,164,000 net ton-miles, according to figures of the Bureau of Railway Economics, Washington. This shows a decrease of about 2 1/4 per cent compared with 1927 and also with 1926.

Improved operating performance has been achieved in many ways. Freight cars in the first nine months have moved an average of 30.7 miles a day, representing an almost continuous increase from 27.6 miles in 1923. This includes all cars in service, either in transit or standing still. Net tons per freight train have increased from 718 in 1923 to 787 in 1928. Freight train speed has risen consistently from 10.8 miles an hour in 1923 to 12.9 miles in 1928. Gross ton-miles per freight train-hour have increased consistently from 16,607 in 1923 to 23,537 in 1928.

Fuel consumed for each 1000 gross ton-miles in freight service has improved progressively from 161 lb. in 1923 to 126 lb. in 1928. Similarly, fuel consumption in passenger service has improved from 18.2 lb. per passenger train car-mile in 1923 to 14.9 lb. in 1928.

Warehouse Prices, f.o.b. Pittsburgh

	Base per Lb.
Plates	3.00c.
Structural shapes	3.00c.
Soft steel bars and small shapes...	2.90c.
Reinforcing steel bars.....	2.75c.
Cold-finished and screw stock—	
Rounds and hexagons.....	3.60c.
Squares and flats.....	4.10c.
Bands	3.60c.
Hoops	4.00c. to 4.50c.
Black sheets (No. 24), 25 or more bundles	3.70c.
Galv. sheets (No. 24), 25 or more bundles	4.55c.
Blue ann'd sheets (No. 10), 1 to 10 sheets	3.35c.
Galv. corrug. sheets (No. 28), per square	\$4.43
Spikes, large	3.40c.
Small	3.80c. to 5.25c.
Boat	3.80c.
Track bolts, all sizes, per 100 count, 60 per cent off list	
Machine bolts, 100 count, 60 per cent off list	
Carriage bolts, 100 count, 60 per cent off list	
Nuts, all styles, 100 count, 60 per cent off list	
Large rivets, base per 100 lb. \$3.50	
Wire, black soft ann'd, base per 100 lb. \$3.00 to 3.10	
Wire, galv. soft, base per 100 lb. 3.00 to 3.10	
Common wire nails, per keg	3.00
Cement coated nails, per keg	3.05

Semi-Finished Steel, Raw Materials, Bolts and Rivets

Mill Prices of Semi-Finished Steel

Billets and Blooms		Sheet Bars		Skelp	
Per Gross Ton		(Open hearth or Bessemer)		(F.o.b. Pittsburgh or Youngstown)	
Rerolling, 4 in. and under 10 in., Pittsburgh	\$33.00	Pittsburgh	\$33.00 to \$34.00	Grooved	1.90c. to 2.00c.
Rerolling, 4 in. and under 10 in., Youngstown	33.00	Youngstown	33.00 to 34.00	Universal	1.90c. to 2.00c.
Rerolling, 4 in. and under 10 in., Cleveland	\$33.00 to 34.00	Cleveland	33.00 to 34.00	Sheared	1.90c. to 2.00c.
Rerolling, 4 in. and under 10 in., Chicago	35.00	Slabs		Wire Rods	
Forging quality, Pittsburgh.....	38.00	(8 in. x 2 in. and under 10 in. x 10 in.)		(Common soft, base)	
		Per Gross Ton		Per Gross Ton	
		Pittsburgh	\$33.00	Pittsburgh	\$42.00
		Youngstown	33.00	Cleveland	42.00
		Cleveland	\$33.00 to 34.00	Chicago	43.00

Prices of Raw Material

Ores		Ferromanganese		Fluxes and Refractories	
Lake Superior Ores, Delivered Lower Lake Ports		Per Gross Ton		Fluorspar	
Per Gross Ton		Domestic, 80%, seaboard.....		Per Net Ton	
Old range Bessemer, 51.50% iron.....	\$4.55	Foreign, 80%, Atlantic or Gulf port, duty paid	105.00	Domestic, 85% and over calcium fluoride, not over 5% silica, gravel, f.o.b. Illinois and Kentucky mines.....	\$18.00
Mesabi Bessemer, 51.50% iron.....	4.40	Spiegeleisen		No. 2 lump, Illinois and Kentucky mines..	18.00
Mesabi non-Bessemer, 51.50% iron.....	4.25	Per Gross Ton Furnace		Foreign, 85% calcium fluoride, not over 5% silica, c.i.f. Atlantic port, duty paid	\$18.00 to 19.00
High phosphorus, 51.50% iron.....	4.15	Domestic, 19 to 21%.....	\$31.00 to \$34.00	Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2 1/2% silica, f.o.b. Illinois and Kentucky mines.....	32.50
Foreign Ore, c.i.f. Philadelphia or Baltimore	Per Unit	Domestic, 16 to 19%.....	29.00 to 32.00	Fire Clay Brick	
Iron ore, low phos., copper free, 55 to 58% iron in dry Spanish or Algerian.....	10.00c.	Electric Ferrosilicon		Per 1000 f.o.b. Works	
Iron ore, low phos., Swedish, average 68% iron	10.00c.	Per Gross Ton Delivered		High-Heat Intermediate Heat Duty Brick	
Iron ore, basic Swedish, average 65% iron.....	9.00c.	50%	\$83.50	Pennsylvania ...	\$43.00 to \$46.00
Manganese ore, washed, 52% manganese, from the Caucasus.....	36c. to 38c.	75%	130.00	Maryland	43.00 to 46.00
Manganese ore, Brazilian, African or Indian, basic 50%	35c. to 37c.	Per Gross Ton Furnace		New Jersey ...	50.00 to 65.00
Tungsten ore, high grade, per unit, in 60% concentrates	\$11.40 to \$12.00	10%	\$35.00	Ohio	43.00 to 46.00
Chrome ore, 45 to 50% Cr ₂ O ₃ , crude, c.i.f. Atlantic seaboard	\$22.00 to \$24.00	11%	37.00	Kentucky	43.00 to 46.00
Molybdenum ore, 85% concentrates of MoS ₂ , delivered	50c. to 55c.	Bessemer Ferrosilicon		Missouri	43.00 to 46.00
Coke		F.o.b. Jackson County, Ohio, Furnace		Illinois	43.00 to 46.00
Per Net Ton		Per Gross Ton		Ground fire clay, per ton	7.00
Furnace, f.o.b. Connellsville prompt	\$2.75	Silvery Iron		Silica Brick	
Foundry, f.o.b. Connellsville prompt	\$3.50 to 4.85	F.o.b. Jackson County, Ohio, Furnace		Per 1000 f.o.b. Works	
Foundry, by-product, Ch'go ovens.....	8.00	Per Gross Ton		Pennsylvania	\$43.00
Foundry, by-product, New England, del'd	11.00	6%	\$24.00	Chicago	52.00
Foundry, by-product, Newark or Jersey City, delivered.....	9.00 to 9.40	7%	25.00	Birmingham	50.00
Foundry, Birmingham.....	5.00	8%	26.00	Silica clay, per ton.....	\$5.50 to 10.00
Foundry, by-product, St. Louis, f.o.b. ovens	8.00	9%	27.00	Magnesite Brick	
Foundry by-prod., del'd St. Louis.....	9.00	Other Ferroalloys		Per Net Ton	
Coal		Ferrotungsten, per lb., contained metal del'd		Standard sizes, f.o.b. Baltimore and Chester, Pa.	\$65.00
Per Net Ton		Ferrochromium, 4 to 6% carbon and up, 65 to 70% Cr, per lb. contained Cr. delivered, in carloads.....		Grain magnesite, f.o.b. Baltimore and Chester, Pa.	40.00
Mine run steam coal, f.o.b. W. Pa. mines	\$1.25 to \$1.75	Ferrovanadium, per lb. contained vanadium, f.o.b. furnace.....		Standard size	45.00
Mine run coking coal, f.o.b. W. Pa. mines	1.50 to 1.75	Ferrocobalt, 15 to 18%, per net ton, f.o.b. furnace, in carloads.....		Chrome Brick	
Gas coal, 1/4-in., f.o.b. Pa. mines.....	1.90 to 2.00	Ferrophosphorus, electric or blast furnace material, in carloads, 18%, Rockdale, Tenn., base, per gross ton.....		Per Net Ton	
Mine run gas coal, f.o.b. Pa. mines.....	1.65 to 1.75	Ferrophosphorus, electric 24%, f.o.b. Anniston, Ala., per gross ton.....		Standard size	\$45.00
Steam slack, f.o.b. W. Pa. mines.....	60c. to 80c.				
Gas slack, f.o.b. W. Pa. mines.....	90c. to 1.00				

Mill Prices of Bolts, Nuts, Rivets and Set Screws

Bolts and Nuts		Bolts and Nuts		Small Rivets	
Per 100 Pieces		Per Cent Off List		(7/8-In. and Smaller)	
(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)	Per Cent Off List	Semi-finished hexagon nuts.....	70	Per Cent Off List	
†Machine bolts	70	Semi-finished hexagon castellated nuts, S.A.E.....	70	F.o.b. Pittsburgh	70 and 18
†Carriage bolts	70	Stove bolts in packages, Pittsburgh.....	80, 10 and 2 1/4	F.o.b. Cleveland	70 and 18
Lag bolts	70	Stove bolts in packages, Chicago.....	75, 20, 10 and 5	F.o.b. Chicago	70 and 10
Plow bolts, Nos. 1, 2, 3 and 7 heads.....	70	Stove bolts in bulk, Pittsburgh.....	80, 10 and 5	Cap and Set Screws	
Hot-pressed nuts, blank or tapped, square.....	70	Stove bolts in bulk, Chicago.....	75, 20, 10, 5 and 2 1/4	(Freight allowed up to but not exceeding 50c. per 100 lb. on lots of 200 lb. or more)	
Hot-pressed nuts, blank or tapped, hexagons.....	70	Tire bolts	60, 5 and 5	Per Cent Off List	
C.p.c. and t. square or hex. nuts, blank or tapped	70	Discounts of 70 per cent off on bolts and nuts applied on carload business. For less than carload orders discounts of 55 to 60 per cent apply.		Milled cap screws.....	80, 10 and 5
Washers*	7.00c. to 6.75c. per lb. off list	Large Rivets		Milled standard set screws, case hardened.....	80 and 5
		(1/4-In. and Larger)		Milled headless set screws, cut thread.....	75 and 10
		Base per 100 Lb.		Upset hex. head cap screws, U.S.S. thread.....	85
		F.o.b. Pittsburgh or Cleveland.....	\$2.90	Upset hex. cap screws, S.A.E. thread.....	85
		F.o.b. Chicago	3.00	Upset set screws.....	80, 10 and 5
				Milled studs	70

*F.o.b. Chicago, New York and Pittsburgh.
†Bolts with rolled thread up to and including 1/2 in. x 6 in. take 10 per cent lower list prices.

Chicago

Steel Releases Indicate Heavy Shipping Volume Early in New Year—Ingot Output Up to 85 Per Cent

CHICAGO, Dec. 18.—Demand for most of the grades of finished steel products remains at a high level, and, with rail mills now rolling on 1929 schedules, ingot output in the Chicago district has advanced to 85 per cent of capacity. Rail mill production has been stepped up 10 points to 60 per cent of capacity in the past week.

A sense of security has taken hold of buyers and sellers. There is less hesitancy in placing forward orders, with the result that books are growing and release orders point to a heavy shipping volume after the turn of the year. Building construction in Illinois in 1928 will exceed the figure for the previous year by not less than 15 per cent. This, however, is not a true reflection of structural steel demand because there was a decrease in small structures, whereas there has existed in the past 12 months a large demand for tall steel frame structures, industrial buildings and railroad and highway bridges.

Railroad equipment contracts are slow in maturing, but the pending volume is large and additional inquiries are in the making. Car shops are reacting slowly to the prospect of an increasing volume of business. It is evident that shop organizations will be built cautiously until a better perspective is to be had of the proportions the car buying movement will attain.

Sales of finished steel products, again influenced by new orders for rails and track supplies, are well up to the average of the past six weeks. Specifications are second only to those of the peak week of the year, which came in the first week in January, following a quiet period in December. Release orders are 50 per cent heavier than in any seven-day period since early in March. This is a reflection of the relatively high consuming demand in December, this year, and it promises shipments in the coming month that will exceed the volume sent from mills in the first month of 1928.

Pig Iron.—Buying of Northern pig iron is light, being confined to odd lots for immediate use. Shipments are well sustained, but a slower rate is expected during the holidays. First quarter coverage is unusually complete, and specifications for release after Jan. 1 are large. In general, melters covered well for the fourth quarter, and spot buying, particularly in the past three weeks, has been in smaller volume than usual at this time of year. Shipments of charcoal iron are heavy, and prices are steady at \$24 a ton, furnace. Shipments of Southern iron into this district in December give promise of being the largest for any month so far this year.

Prices per gross ton at Chicago:

N'th'n No. 2 fdy., sil. 1.75 to 2.25...	\$20.00
N'th'n No. 1 fdy., sil. 2.25 to 2.75...	20.50
Malleable, not over 2.25 sil.....	20.00
High phosphorus	20.00
Lake Super. charcoal, sil. 1.50.....	27.04
So'th'n No. 2 fdy. (all rail).....	\$22.51 to 23.01
Low phos., sil. 1 to 2, copper free..	29.50
Silvery, sil. 8 per cent.....	30.79
Bess. ferrosilicon, 14-15 per cent...	47.29

Prices are delivered consumers' yards except on Northern foundry, high phosphorus and malleable, which are f.o.b. local furnace, not including an average switching charge of 61c. per gross ton.

Ferroalloys.—The price of ferromanganese is steady at \$105 a ton, seaboard. The spiegeleisen market is quiet.

Prices delivered Chicago: 80 per cent ferromanganese, \$112.56; 50 per cent ferrosilicon, \$83.50 to \$88.50; spiegeleisen, 19 to 21 per cent, \$40.76.

Coke.—Shipments of by-product foundry coke are heavy and equal to production. Producers' stocks are light. Prices are firm at \$8 a ton, f.o.b. local ovens.

Bolts, Nuts and Rivets.—Specifications are heavier, but for the most part for delivery after the turn of the year. Producers, finding shipments lighter, are building stocks against deliveries to be made after Jan. 1.

Wire Products.—Forward contracting is sluggish and spot purchases are dull as the end of the year approaches. Orders from the jobbing trade in the South are in good volume, but in the Northwest orders are lighter. Specifications from the manufacturing trade are smaller. Producers, anxious to hold stocks in most lines at their present size, have curtailed output, the average now being about 62 per cent of capacity. Shipments of road mesh are light, but deliveries of woven wire fencing are in good volume and give promise of bringing the total tonnage for 1928 in line with that of 1927. Jobbers' stocks of nails are said to be small, and current orders are more numerous than usual at this time of year.

Reinforcing Bars.—Buyers of reinforcing bars have been unusually inactive, considering that a round tonnage is pending. Architects are busy, so must dealers attribute the lull in business to the holiday season and expect a more active market soon after the turn of the year. Shipments from shops are in good volume for this time of the year. Backlogs are shrinking and ship operations are tapering. Warehouse prices now being named are 2.35c. a lb. for the billet bar product and 2.20c. for rail steel bars. Protections on old quotations expired Dec. 15.

Sheets.—This market is quiet. For the most part, users have specified in full against fourth quarter contracts,

but insist that much of the tonnage be held for shipment after the turn of the year. Producers get reports that stocks in the hands of most consumers are light and on that score they anticipate a sharp upward turn in specifications and new buying after Jan. 1. Among the more active users of sheets at this time may be named car builders, who are in the market for roofing sheets; the agricultural implement trade and manufacturers of furnaces. Sales are unusually light and do not afford a satisfactory test of the market.

Base prices per lb., deliv'd from mill in Chicago: No. 24 black sheets, 3.00c.; No. 24 galv., 3.75c.; No. 10 blue ann'd, 2.25c. Deliv'd prices at other Western points are equal to the freight from Gary, plus the mill prices, which are 5c. per 100 lb. lower than Chicago delivered prices.

Cast Iron Pipe.—The American Cast Iron Pipe Co. has taken 1800 tons of pipe for Racine, Wis., at \$35.75 a ton, Birmingham, or \$44.25 a ton, delivered. This price is \$2.25 a ton above the lowest quotation by an American maker last week at Detroit. Producers have not named winter buying prices, and so far local conditions and the character of orders seem to be the determining factors in setting prices for orders to be delivered in the spring. Car lots are moving in this district at \$37 to \$38 a ton, Birmingham. Several public utilities are preparing schedules for 1929. Deliveries are prompt on practically all common sizes.

Prices per net ton, deliv'd Chicago: Water pipe, 6-in. and over, \$42.20 to \$46.20; 4-in., \$46.20 to \$50.20; Class A and gas pipe, \$4 extra.

Structural Material.—Reports are persistent that the Chicago Board of Trade Building, requiring 18,500 tons of steel, has been placed with a local fabricator. As a general thing, the local market is quiet. Awards for the week total 2000 tons and fresh inquiry is for 1200 tons of bridges for the Kansas City Southern. The bulk of the steel needed for the Mercantile Mart, 38,000 tons in all, has been shipped here by boat and the work of fabrication in local shops will soon be under way. Shops are operating at a fair winter rate, and the anxiety to maintain present schedules leads to keen competition, with no improvement in prices. Deliveries on shapes are improved, mill promises now being from two to three weeks. Forward contracting is moderately active at 2c. to 2.10c. Chicago. Following the custom in recent years, fabricators are not inclined to make blanket contracts, but prefer to buy against actual awards.

Mill prices on plain material, per lb.: 2c. to 2.10c. base, Chicago.

Plates.—Outstanding among orders for plates this week is 33,000 tons placed by a Milwaukee welded pipe maker for a 287-mile gas transmission line from Baxter Basin, Wyo., to Ogden, Utah. An oil producer in Texas has ordered storage tanks to be fabricated in this district that will take 6000 tons of plates. Miscellaneous inquiry for similar projects in the Southwest will take 8000 tons. Or-

ders for railroad equipment total 200 gondolas, requiring 3000 tons of steel. It is reported that the Santa Fe is making revisions to its recent inquiry for passenger train equipment. Although specifications against recent car orders are now being sent to mills by shops, the total tonnage is not of large proportions. Builders of railroad equipment operated at very low capacity all through the fall months, and they are moving cautiously in the matter of building larger organizations than needed at this time for work in hand. This is tending to make orders move slowly through shops. Deliveries on plates range from two to three weeks, and it is generally estimated that car shops will not increase operations until late in January. Prices for plates in Chicago are steady at 2c. to 2.10c. per lb.

Mill prices on plates, per lb.: 2c. to 2.10c. base Chicago.

Hot - Rolled Strip.—Forward contracting in and near Chicago in hot-rolled strip is making rapid headway among the smaller users. Some large buyers, notably those in Detroit, are staying out of the market. Current specifications are in good volume.

Rails and Track Supplies.—Chicago rail mills have started to roll against 1929 contracts, and, as a result, output has been advanced to 60 per cent of capacity. A Western railroad has closed for 15,000 tons of standard-section rails, and inquiry stands at 70,000 tons. The Illinois Central, the Burlington and the Rock Island are among the large Western lines that have not yet made 1929 commitments. Miscellaneous purchases of track supplies total 18,000 tons, and fresh inquiry is for a like amount and includes 8000 tons of iron tie plates. Although the general market for steel tie plates holds at \$43 a ton, there are reports of concessions on several recent orders.

Prices f.o.b. mill, per gross ton: Standard section open-hearth and Bess. rails, \$43; light rails, rolled from billets, \$36. Per lb.: Standard railroad spikes, 2.80c.; track bolts with square nuts, 3.80c.; steel tie plates, 2.15c.; angle bars, 2.75c.

Old Material.—The Chicago scrap market is less active as the holiday season approaches. Large consumers

of the heavy tonnage grades will still take shipments on contracts and small users continue to hold stocks to the minimum and enter the market for carloads as required. It is said that the Illinois Central obtained \$17.05 a ton on track for 1000 tons of rerolling rails. The supply of borings appears to be a trifle short of demand and dealers are paying \$12.25 to \$12.30 a ton delivered. The cast iron car wheel market is quiet and prices are easier, as gaged by a recent sale of several hundred tons. Shortage of the malleable grades is not relieved, and prices are strong. Shipments by railroads are well sustained, but cold weather and snow may hamper the gathering and preparation of scrap, with resultant lighter shipments.

Prices deliv'd Chicago district consumers:

Per Gross Ton

Basic Open-Hearth Grades:

Heavy melting steel.....	\$14.50 to \$15.00
Shoveling steel	14.50 to 15.00
Frogs, switches and guards, cut apart, and misc. rails	15.75 to 16.25
Hydraul. compressed sheets	13.00 to 13.50
Drop forge flashings.....	10.50 to 11.00
Forg'd, cast and r'l'd steel carwheels	17.75 to 18.25
Railr'd tires, charg. box size	17.50 to 18.00
Railr'd leaf spring cut apart	17.50 to 18.00

Acid Open-Hearth Grades:

Steel couplers and knuckles	16.00 to 16.50
Coil springs	18.25 to 18.75

Electric Furnace Grades:

Axle turnings	14.50 to 15.00
Low phos. punchings.....	16.50 to 17.00
Low phos. plate, 12 in. and under	16.50 to 17.00

Blast Furnace Grades:

Axle turnings	12.00 to 12.50
Cast iron borings.....	11.75 to 12.25
Short shoveling turnings.....	11.75 to 12.25
Machine shop turnings.....	8.00 to 8.50

Rolling Mill Grades:

Iron rails	15.00 to 15.50
Rerolling rails	16.50 to 17.00

Cupola Grades:

Steel rails less than 3 ft.	17.25 to 17.75
Steel rails less than 2 ft.	19.00 to 19.50
Angle bars, steel.....	16.50 to 17.00
Cast iron carwheels.....	14.00 to 14.50

Malleable Grades:

Railroad	17.00 to 17.50
Agricultural	12.50 to 13.00

Miscellaneous:

*Relaying rails, 56 to 60 lb.	23.00 to 25.00
*Relaying rails, 65 lb. and heav.	26.00 to 31.00

Per Net Ton

Rolling Mill Grades:

Iron angles and splice bars	14.50 to 15.00
Iron arch bars and transoms	20.50 to 21.00
Iron car axles.....	26.50 to 27.00
Steel car axles.....	15.50 to 16.00
No. 1 railroad wrought.....	13.25 to 13.75
No. 2 railroad wrought.....	13.00 to 13.50
No. 1 busheling.....	11.50 to 12.00
No. 2 busheling.....	6.00 to 6.50
Locomotive tires, smooth.....	13.25 to 13.75
Pipes and flues.....	9.50 to 10.00

Cupola Grades:

No. 1 machinery cast.....	15.50 to 16.00
No. 1 railroad cast.....	15.00 to 15.50
No. 1 agricultural cast.....	14.50 to 15.00
Stove plate	12.25 to 12.75
Grate bars	12.50 to 13.00
Brake shoes	11.50 to 12.00

*Relaying rails, including angle bars to match, are quoted f.o.b. dealers' yards.

Bars.—Buying is active, and for the week totals more than shipments. Deliveries of mild steel bars range from three to five weeks. Now that the automobile manufacturers have dropped to a lower rate of output,

farm machinery makers are again in the lead as the largest single group of bar users. A review of the year brings to light more forcibly than before the rapidly spreading use of steel bars, not only in total tonnage, but in a much wider circle of consumers. Specifications for alloy steel bars are in fair volume, and prices, with forward contracting practically completed, are steady. The local iron bar market is quiet. Most users of rail steel bars are committed for the first quarter at 1.95c. per lb., Chicago Heights. Specifications have dropped sharply for bars that are to be delivered before the first of the year, but releases are large for shipments after Jan. 1.

Mill prices per lb.: Soft steel bars, 2c. to 2.10c., base, Chicago; common bar iron, 2c. to 2.10c., base, Chicago; rail steel bars, 1.95c., base, Chicago Heights mill.

Ohio River Steel Tonnage Mounting

Steel products moved on the Ohio River made another high record mark in November, the monthly report of the United States Corps of Engineers, Pittsburgh office, reports, with a total of 137,019 net tons. The best previous record, made in October, was bettered by almost 7000 tons.

Total tonnage for the year to Nov. 30 was brought to 1,162,445 tons. This also is a record figure and approximately 150,000 tons in excess of the combined movement for the entire years of 1926 and 1927. For the 11 months last year the movement was 628,790 tons, of which November contributed 70,863 tons.

Large Automotive Parts Makers to Be Merged

The Borg-Warner Corporation, Chicago, and the Galesburg Coulter-Disc Co., Galesburg, Ill., large manufacturers of automobile and agricultural implement parts, will be consolidated through an exchange of stock, probably on a share for share basis. The Borg-Warner Company was formed this year by a merger of the Borg & Beck Co., the Marvel Carburetor Co., the Warner Gear Co., and the Universal Joint Co., and manufactures carburetors, transmission gears and universal joints. Its plants are at Chicago, Rockford and Moline, Ill.; Indianapolis and Muncie, Ind., and Flint, Mich. The Galesburg Coulter-Disc Co. last year absorbed the Indiana Rolling Mill Co., Newcastle, Ind., and manufactures sheet steel shovels, blades for farming implements, and discs for automobile clutches, with plants at Galesburg and Newcastle.

Messrs. C. P. Sandberg, consulting and inspecting engineers, London and New York, have removed their offices in the latter city to the Cunard Building, 25 Broadway.

Warehouse Prices, f.o.b. Chicago

Base per Lb.

Plates and structural shapes.....	3.10c.
Soft steel bars.....	3.00c.
Reinforc'g bars, billet steel.....	2.35c.
Reinforc'g bars, rail steel.....	2.20c.
Cold-fin. steel bars and shafting—	
Rounds and hexagons.....	3.60c.
Flats and squares.....	4.10c.
Bands	3.65c.
Hoops	4.15c.
Black sheets (No. 24).....	3.80c.
Galv. sheets (No. 24).....	4.65c.
Blue ann'l'd sheets (No. 10).....	3.35c.
Spikes, stand. railroad.....	3.55c.
Track bolts	4.55c.
Rivets, structural	3.60c.
Rivets, boiler	3.60c.

Per Cent Off List

Machine bolts	60
Carriage bolts	60
Coach or lag screws.....	60
Hot-pressed nuts, sq. tap. or blank.....	60
Hot-pressed nuts, hex., tap. or blank.....	60
No. 8 black ann'l'd wire, per 100 lb.....	\$3.30
Com. wire nails, base per keg.....	3.20
Cement c'd nails, base per keg.....	3.20

Philadelphia

Minimum Prices on Plates and Shapes Reduced \$1 a Ton—Contracting Light

PHILADELPHIA, Dec. 18.—Eastern Pennsylvania producers of plates and shapes expect to follow the action of the Bethlehem Steel Co. in reducing prices on plates to a minimum of 2c., Coatesville, and shapes to 2c., mill. The revision on shapes formally recognizes prices that have prevailed on desirable business for some time. Some first quarter plate contracts, however, have been closed at the former level of 2.05c., Coatesville, and on such business it may be necessary to rewrite the contracts to the new level, which had previously been granted only to certain large users. Bar quotations are unchanged at 1.90c., Pittsburgh, and 2c., Lackawanna, for first quarter contracts. Black and galvanized sheet prices are quite firm for first quarter, but blue annealed sheets range from 2c. to 2.10c., Pittsburgh. The holidays and the year-end inventory are beginning to affect the iron and steel markets, so that almost no new tonnage is being booked, and specifications for shipments on current contracts have shown a decline.

Pig Iron.—Standard foundry iron continues at \$20.50 to \$21 per ton, furnace, the higher quotation being for first quarter. While some small orders for the next quarter have been placed at the top price, substantial quantities have generally brought out \$20.50, the price for delivery to the end of this year. In the past week some contracts have been closed. About 300 tons of No. 3 foundry for the Lobdell Car Wheel Co., Wilmington, Del., went to an eastern Pennsylvania furnace and about 2000 tons of foundry grade for the Salem Brass & Iron Mfg. Co., Bridgeton, N. J., was distributed among four eastern Pennsylvania makers. The National Radiator Co., which closed a few weeks ago on a substantial tonnage of foundry iron for New Castle, Pa., has also bought 500 tons for its Trenton, N. J., plant. This order, in addition to iron still to be shipped on contracts at Trenton, is expected to be sufficient to carry the company through most of the next quarter. Low phosphorus pig iron consumers in this district are in most cases covered for their requirements in the next few months. The Virginia pig iron interest has sold about 17,000 tons of pig iron in the past week to Virginia cast iron pipe foundries. This sale has reduced the total unsold tonnage of the furnace by half.

Prices per gross ton at Philadelphia:

East. Pa. No. 2, 1.75 to	
2.25 sil.	\$21.26 to \$21.76
East. Pa. No. 2X, 2.25 to	
2.75 sil.	21.76 to 22.26
East. Pa. No. 1X,	22.26 to 22.76
Basic (del'd east. Pa.)...	20.25 to 20.75
Gray forge	20.50 to 21.00
Malleable	21.25 to 21.75
Stand. low phos. (f.o.b.	
N. Y. State furnace)...	22.00 to 23.00
Cop. b'r'g low phos. (f.o.b.	
furnace)	23.00 to 23.50
Va. No. 2 plain, 1.75 to	
2.25 sil.	25.29
Va. No. 2X, 2.25 to 2.75 sil.	25.79

Prices, except as specified otherwise, are deliv'd Philadelphia. Freight rates: 76c. to \$1.64 from eastern Pennsylvania furnaces; \$4.54 from Virginia furnaces.

Bars.—Prices are firm at 1.90c. to 2c., Pittsburgh, or 2.22c. to 2.32c., delivered Philadelphia. A moderate tonnage of bars has been entered on first quarter contracts, and no recession from the present price level seems to be expected by the mills.

Shapes.—Announcement last week of first quarter prices by the Bethlehem Steel Co. established the shape market at 2c. to 2.10c., Bethlehem, or nearest mill to consumer. While this is a \$1 a ton reduction from the recent quotation of 2.05c., f.o.b. mill, it openly recognizes the level prevailing for some time on desirable business. A substantial tonnage of fabricated steel is in prospect, and pending shipbuilding contracts should provide some good orders next year.

Plates.—Revision of the market on plates to a range of 2c. to 2.10c., Coatesville, represents a decline of \$1 a ton from 2.05c., Coatesville, at which most contracts have been made for first quarter. All eastern Pennsylvania plate mills have not yet adhered to the price announced by the Bethlehem Steel Co., but expect to do so in a few days and probably will rewrite some contracts to the lower level. Specifications have diminished as the year end approaches, but some substantial tonnage is in prospect for next year.

Warehouse Business.—Orders for steel products from stock are maintained at a good level and prices are firm.

Sheets.—Contracting for the next

Warehouse Prices, f.o.b. Philadelphia

	Base per Lb.
Plates, ¼-in. and heavier.....	2.70c.
Plates, ⅝-in.	2.90c.
Structural shapes	2.70c.
Soft steel bars, small shapes, iron bars (except bands).....	2.80c.
Round-edge iron	3.50c.
Round-edge steel, iron finished 1½ x 1½ in.	3.50c.
Round-edge steel, planished.....	4.30c.
Reinforc. steel bars, sq. twisted and deform.	2.60c. to 2.80c.
Cold-fin. steel, rounds and hex....	3.45c.
Cold-fin. steel, sq. and flats.....	3.95c.
Steel hoops	3.60c.
Steel bands, No. 12 to ⅝-in., inclus.	3.35c.
Spring steel	5.00c.
*Black sheets (No. 24).....	4.00c.
†Galvanized sheets (No. 24).....	4.75c.
Blue ann'l'd sheets (No. 10).....	3.15c.
Diam. pat. floor plates—	
¼-in.	5.30c.
⅝-in.	5.50c.
Rails	3.20c.
Swedish iron bars.....	6.60c.

*For 50 bundles or more; 10 to 49 bun., 4.10c. base; 1 to 9 bun., 4.35c. base.
†For 50 bundles or more; 10 to 49 bun., 4.95c. base; 1 to 9 bun., 5.30c. base.

quarter has not yet developed in the proportions expected, but consumers are taking shipments quite freely on present contracts. Mills are maintaining prices firmly at 2.85c. per lb., Pittsburgh, or 3.17c., Philadelphia, on black sheets, and 3.60c., Pittsburgh, or 3.92c., Philadelphia, on galvanized. Blue annealed sheets continue to range from 2c. to 2.10c., Pittsburgh, or 2.32c. to 2.42c., Philadelphia, the lower price being for the narrower widths, on which there is competition from the continuous sheet mills.

Imports.—In the week ended Dec. 15, steel arrivals at this port consisted of 210 tons of structural shapes and 55 tons of steel bars from Belgium, 36 tons of shapes from Germany, 22 tons of steel scrap from the United Kingdom and 10 tons of ferrochrome from Switzerland. No pig iron or ore importations are reported.

Old Material.—The week has been quiet, with transactions confined to purchases by brokers filling contracts with mills. In the absence of any buying of consequence prices are unchanged. Dealers report some difficulty in obtaining No. 1 heavy melting steel at the prices they have offered, and in some cases are paying up to \$15.25 per ton for material to fill \$15.50 per ton contracts with eastern Pennsylvania mills.

Prices per gross ton delivered consumers' yards, Philadelphia district:

No. 1 heavy melting steel.....	\$15.00 to \$15.50
Scrap T rails.....	14.50 to 15.00
No. 2 heavy melting steel.....	12.00 to 12.50
No. 1 railroad wrought.....	16.00 to 16.50
Bundled sheets (for steel works)	11.00
Machine shop turnings (for steel works)	11.00 to 11.25
Heavy axle turnings (or equiv.)	12.50
Cast borings (for steel works and roll. mill)...	11.00 to 11.50
Heavy breakable cast (for steel works)	15.50 to 16.00
Railroad grate bars.....	12.50
Stove plate (for steel works)	12.50
No. 1 low phos., hvy., 0.04% and under.....	19.00 to 20.00
Couplers and knuckles....	17.50 to 18.00
Rolled steel wheels.....	17.00 to 17.50
No. 1 blast f'nace scrap....	10.00 to 11.00
Wrot. iron and soft steel pipes and tubes (new specific.)	15.00
Shafting	19.00 to 20.00
Steel axles	21.50 to 22.00
No. 1 forge fire.....	12.00 to 12.50
Cast iron carwheels.....	16.50
No. 1 cast.....	16.25 to 16.75
Cast borings (for chem. plant)	15.00
Steel rails for rolling....	16.50 to 17.00

German Interests Plan Argentine Wire Mill

HAMBURG, GERMANY, Dec. 1.—The Allgemeine Electricitäts Gesellschaft and the Felton & Guilleaume interests, which have acquired joint control of the Sociedad Electro Metalurgico Argentina at Buenos Aires, Argentina, plan the construction of a modern wire mill in Buenos Aires. The plant will cost close to \$1,500,000 and will produce insulated wires and cables and some barbed wire and wire netting.

Cleveland

Steel Moving in Fair Volume for December—Some Hold-up of Shipments to Automobile Companies

CLEVELAND, Dec. 18.—Specifications against outstanding contracts for steel bars, plates and structural shapes continue to come out in fair volume, although there is no special incentive, in view of the fact that prices for the next quarter will not be higher. Some of the mills have closed first quarter contracts with most of their regular customers, but others, which have not been pushing contracts, have not made many commitments for that delivery.

While 1.95c., Cleveland, is the usual quotation on steel bars by outside mills, when using Cleveland as a basing point, some of the mills have gone to 1.90c., Cleveland, thus meeting the Cleveland mill price. Structural shapes and plates are steady at 1.90c. to 1.95c., Pittsburgh, the lower price for large-lot buyers. Small plate consumers are placing first quarter contracts with their regular sources of supply usually at 1.95c., Pittsburgh.

Sheet and strip steel are moving rather slowly to the automotive industry, although probably as well as could be expected at this time of the year. There has been some holding up of deliveries on auto body sheets, also failure to issue releases against other grades of sheets and strip steel because of delay by one automobile manufacturer in getting under production on new models. However, it is expected that a large production on these cars will be started early in January. Some automobile manufacturers have placed contracts for round tonnages of sheets and hot-rolled strip steel for the first quarter, but others have not come into the market. Most hot-rolled strip users in this territory have already contracted.

Structural material is moving well in small lots. New inquiries include 4000 tons for grade crossing elimination work in Cleveland. The hangar for the Goodyear-Zeppelin Co., Akron, requiring 6500 tons, may be placed this week.

Pig Iron.—The market has quieted down materially, although Cleveland interests sold 18,000 tons in foundry and malleable iron during the week, or the same tonnage as during the previous week. Very little of this business came from the immediate Cleveland territory. Inquiry is subsiding, and little is now pending. Most of the larger consumers have covered for the first quarter and few show any inclination to place second quarter contracts. With inventories close at hand, shipments are tapering off, as quite a few foundries are holding up shipments until the first of the year. Stocks in consumers' and furnace yards are low, but some of the furnaces will accumulate iron for their stock piles by the end of the month. Furnaces have fairly good order books for the first quarter and are holding firmly to recent prices. They do not look for any weakening in the market through surplus output, unless the demands of the steel industry should fall off to an extent that steel makers would have iron to sell. Cleveland furnaces quote foundry and malleable iron at \$18.56 and another Lake furnace interest is holding to \$19.50. The Michigan mar-

ket is unchanged at \$20. Low phosphorus iron is inactive, although a few car lot sales are reported at \$27. Some business has developed in the Chicago territory, but a \$26.50 price quoted by a Valley producer appeared too high to take the order.

Prices per gross ton at Cleveland:	
N'th'n fdy., sil. 1.75 to 2.25	\$19.50
S'th'n fdy., sil. 1.75 to 2.25, \$22.50 to	23.00
Malleable	19.50
Ohio silvery, 8 per cent.	29.00
Basic Valley furnace	17.50
Stand. low phosph., Valley	26.50 to 27.00

Prices, except on basic and low phosphorus, are delivered Cleveland. Freight rates: 50c. from local furnaces; \$3 from Jackson, Ohio; \$6 from Birmingham.

Sheets.—While specifications from the automotive industry, which fell off early in the month, gained slightly the past week, releases from that industry are still rather slow. Some of the automobile manufacturers during the week released fair tonnages of auto body sheets for January production. One of the body plants has accumulated a large stock because of the delay in starting production on new models of a low priced car, and sheet shipments are backing up at the mills. Not many of the larger consumers in the automotive field have as yet contracted for the first quarter. Prices lower than those regularly named for the first quarter have pretty generally disappeared.

Semi-Finished Steel.—The leading local producer has closed with all its consumers for sheet bars, billets and slabs for the first quarter and reports that all its business was taken at \$34, Cleveland and Youngstown. This mill is still operating at capacity.

Wire Products.—The price advance

Warehouse Prices, f.o.b. Cleveland

	Base per Lb.
Plates and struct. shapes	3.00c.
Soft steel bars	3.00c.
Reinforc. steel bars	2.25c. to 2.75c.
Cold-fin. rounds and hex.	3.65c.
Cold-fin. flats and sq.	4.15c.
Hoops and bands	3.65c.
Cold-finished strip	5.95c.
Black sheets (No. 24)	3.50c.
Galvanized sheets (No. 24)	4.45c.
Blue ann'l'd sheets (No. 16)	3.25c.
No. 9 ann'l'd wire, per 100 lb.	\$2.85
No. 9 gal. wire, per 100 lb.	3.30
Com. wire nails, base per keg	2.85

*Net base, including boxing and cutting to length.

is bringing out a good volume of specifications for nails and wire against contracts that expire Jan. 1. These specifications will be accepted to the end of the month. As buyers will have good stocks bought at the old prices, it may be some time before there will be much test of the higher prices.

Reinforcing Bars.—Several fair-sized jobs that came out recently are still pending. The only award of size is a 400-ton lot in Akron. New inquiry is light. Prices are still irregular, both for mill and warehouse orders.

Iron Ore.—Approximately 500,000 tons less ore was on Lake docks Dec. 1 than on the same date a year ago, the amount having been 6,454,126 tons, against 6,944,350 tons on Dec. 1, 1927. Receipts at Lake Erie ports during the present year were 36,958,626 tons, compared with 36,552,791 tons last year. Shipments from these docks during the year to Dec. 1 were 26,136,092 tons, against 26,046,404 tons last year. The gain in Lake shipments this year compared with last year was shown largely in an increased movement to Lake Michigan ports. Shipments to other than Lake Erie ports, the bulk of which went to South Chicago, Gary and Indiana Harbor, were 16,490,048 tons this year, compared with 14,042,807 tons in 1927. Cleveland led as a shipping port, receiving 9,375,764 tons. Conneaut came second with 8,437,401 tons and South Chicago was third with receipts of 7,090,786 tons.

Strip Steel.—Specifications for hot and cold-rolled strip have slowed down. While some of the larger consumers in the automotive field have placed contracts for the first quarter, others have not yet made commitments for that delivery. On hot-rolled strip, 1.80c., Pittsburgh, for material wider than 6 in. and 1.90c. for 6 in. and narrower are now being commonly quoted. Prices \$2 a ton higher usually apply to less than car lots. Cold-rolled strip is firm at 2.85c., Cleveland and Pittsburgh.

Bolts, Nuts and Rivets.—Buyers are placing contracts quite freely for the first quarter, following the reaffirming of present prices for that delivery. With inventory time approaching, bolt and nut specifications have declined considerably. Rivets continue to move fairly well.

Coke.—Specifications for foundry coke are holding up fairly well for this time of the year, but very few consumers have as yet placed first quarter contracts. By-product foundry coke is unchanged at \$7.75, Painesville.

Old Material.—The market shows a firmer tone, and prices have advanced 25c. to 50c. a ton on heavy melting steel, machine shop turnings, blast furnace scrap and on some other grades. While there is little new consumer demand, mills are taking shipments rather freely and the price stiffening seems due to the demand from

dealers who have short orders. Dealers are holding for \$15.25 for No. 1 heavy melting steel, and there does not seem to be much available at a lower price. They are paying as high as \$11.75 for blast furnace scrap, or 25c. a ton above the recent maximum quotation. A Youngstown mill purchased a small tonnage of heavy melting steel at a reported \$18 price and dealers are offering \$17.50 to cover against this order.

Prices per gross ton delivered consumers' yards:

Basic Open-Hearth Grades		
No. 1 heavy melting steel.	\$14.75 to	\$15.25
No. 2 heavy melting steel.	14.25 to	14.75
Compressed sheet steel.	14.50 to	15.00
Light bundled sheet		
stamp's	12.00 to	12.50
Drop forge flashings.	12.25 to	12.75
Machine shop turnings.	10.00 to	10.50
No. 1 railroad wrought.	12.75 to	13.00
No. 2 railroad wrought.	14.50 to	15.00
No. 1 bushing.	12.50 to	12.75
Pipes and flues.	9.00 to	9.50
Steel axle turnings.	12.50 to	13.00
Acid Open-Hearth Grades		
Low phos. forging crops.	16.00 to	16.50
Low phos. billet, bloom and slab crops.	17.00 to	17.50
Low phos. sheet bar crops.	16.50 to	17.00
Low phos. plate scrap.	15.50 to	16.00
Blast Furnace Grades		
Cast iron borings.	11.25 to	11.75
Mixed bor'g and short turn'gs	11.25 to	11.75
No. 2 bushing.	11.25 to	11.75
Cupola Grades		
No. 1 cast.	16.50 to	17.00
Railroad grate bars.	11.00 to	12.00
Stove plate	12.00 to	12.50
Rails under 3 ft.	16.75 to	17.25
Miscellaneous		
Railroad malleable	16.00 to	16.50
Rails for rolling	16.25 to	16.50

Sheet Steel Shipments Dropped in November

Shipments of steel sheets fell off sharply during November, having been 307,790 tons, compared with 354,925 tons in October, according to the monthly report of the National Association of Flat Rolled Steel Manufacturers, Cleveland. The lessened demand evidently resulted from the curtailment in the automobile industry. However, production declined only slightly, having been 358,402 tons, compared with 369,243 tons during the previous month. Production exceeded shipments by slightly over 50,000 tons. While both shipments and production indicated a little slowing down in the industry, sales gained slightly during November. Unfilled orders on Dec. 1 were 40,000 tons larger than on Nov. 1. This increase seems due to the fact that, while shipments declined, there was a slight increase in sales. The November report and comparisons in net tons follow:

	Nov.	Oct.	Sept.
Total number of mills.	726	724	721
Capacity per month	487,280	508,000	450,500
Percentage re- porting	70.2	70.2	70.1
Sales	346,041	344,614	370,936
Production	358,402	369,243	318,907
Shipments	307,790	354,925	322,876
Unfilled orders.	565,739	525,161	539,960
Unshipped orders	111,014	100,800	102,313
Unsold stocks	63,014	49,800	44,519
Percentages to Capacity			
Sales	101.1	96.6	117.5
Production	104.8	103.5	101.0
Shipments	89.9	99.5	102.2
Unfilled orders.	165.3	147.3	171.0
Unshipped orders	32.4	28.3	32.4
Unsold stocks	18.4	14.0	14.1

New York

Bethlehem Steel Co. Announces First Quarter Prices on Plates, Shapes and Bars—Pig Iron Quiet

NEW YORK, Dec. 18.—Pig iron buying is adversely affected by the approach of the holidays. Bookings in this district for the week barely exceeded 5000 tons, and inquiries are fewer. Suspensions of shipments are rarely reported, however, and in some instances expedited deliveries are asked for. Indications point to sustained foundry melt, with holiday shutdowns held down to the minimum. Prices on Buffalo foundry iron range from \$17.50 to \$18, base furnace; eastern Pennsylvania producers quote \$19.50 to \$20, base furnace. The General Electric Co. has closed against at least part of its inquiry for 5500 tons for its Eastern plants. Another inquiry now current, for approximately 5000 tons for first quarter, calls for deliveries outside of this district. The New York Central is in the market for 200 tons of foundry, 50 tons of charcoal and 35 tons of silvery for shipment to Frankfort, N. Y., or Elkhart, Ind. The Delaware, Lackawanna & Western wants 150 tons of No. 2 plain and No. 2X for delivery at Scranton, Pa. Barge shipments of pig iron on the New York State barge canal, originating at Buffalo and points westward totaled 122,456 gross tons for the 1928 season of navigation.

Prices per gross ton, delivered New York district:

Buffalo No. 2 fdy., sil.	1.75 to 2.25	\$22.41 to \$22.91
*Buf. No. 2, del'd east.		
N. J.	20.78 to	21.28
East. Pa. No. 2 fdy., sil.	1.75 to 2.25	20.89 to 22.52
East. Pa. No. 2X fdy., sil.	2.25 to 2.75	21.39 to 23.02
East. Pa. No. 1X fdy., sil.	2.75 to 3.25	21.89 to 23.52

Freight rates: \$4.91 from Buffalo, \$1.39 to \$2.52 from eastern Pennsylvania.

*Price delivered to New Jersey cities having rate of \$3.28 a ton from Buffalo.

Ferroalloys.—Signs of a possible scarcity of spiegeleisen are discernible. The leading producer in this country has blown out one furnace for relining and another producer has made purchases of foreign alloy to fill contracts. One British producer is out of the export market for first quarter. Sales of about 300 tons of foreign spiegeleisen were made during the last week. Quotations for the domestic alloy are unchanged at \$34, furnace, for the 19 to 21 per cent alloy in carload lots. A few carloads of ferromanganese have been sold at \$105, seaboard basis, for delivery this month.

Plates, Shapes and Bars.—The Bethlehem Steel Co. surprised the trade late last week by an announcement of first quarter prices on these products, which in the case of plates and shapes at Eastern mill basing points are \$1 a ton below the levels which have recently been recognized as the market. The Bethlehem announcement puts plates and shapes at 2c. to 2.10c.,

Eastern basing points, or 2.17½c., New York, for plates and 2.14½c., New York, for shapes. Eastern plate mills had made a considerable number of first quarter contracts with regular customers at 2.22½c., New York, and a few at 2.27½c., New York, and the probability is that some of these will be rewritten to the new minimum base. Some large structural fabricators in the New York district are understood to have been getting prices below 2c., mill, but the majority of users have been paying 2.05c., and some small buyers have not been getting less than 2.10c. For shipment from the Cambria works, prices remain at 1.90c., Pittsburgh, for all three products, but Buffalo prices are \$1 a ton lower than those recently prevailing, the range now being 2c. to 2.10c., against 2.05c. to 2.10c. which had applied on a good deal of the fourth quarter business. The Bethlehem company amplifies its first announcement by saying that 2.14½c., New York, on shapes and 2.17½c., New York, on plates are the firm minimums "on the very largest tonnages," while prices on "customary tonnages" will be \$1 higher. December business has fallen off considerably. Many contract buyers did not specify their fourth quarter contracts in full by Dec. 15, which was the last day that some companies would accept specifications. Some contracts have been extended, but generally new first quarter contracts have been prepared and the old contracts cancelled.

Mill prices per lb., deliv'd New York: Soft steel bars, 2.24c. to 2.34c.; plates, 2.17½c. to 2.27½c.; struc. shapes, 2.14½c. to 2.24½c.; bar iron, 2.14c. to 2.24c.

Sheets and Strip.—Specifications against fourth quarter contracts for sheets and strip were fairly good, but were not as heavy as the trade expected in view of the fact that prices announced for first quarter are higher than those prevailing on expiring contracts. Sheet prices are holding, but producers of hot-rolled strips have not been able to get all that they set out to charge. The price for strips wider than 6 in. was to be 1.90c., Pittsburgh, for all but the very largest users and that for narrower strips, 2c., but nearly all contract buyers, large or small, have been able to cover at \$2 a ton under these prices.

Reinforcing Bars.—The Turner Construction Co. opened bids last week on the 8500 tons of bars for the Delaware, Lackawanna & Western terminal warehouse at Jersey City, and it is understood that the job will be placed this week among three or more distributors. The volume of pending work continues to increase, but the tonnage being placed is not large and there is little prospect for increased activity before the first of the year. Prices are unchanged.

Warehouse Business.—Thus far December has compared favorably with November in the volume of orders, but business is beginning to diminish as the holidays approach. Demand for black and galvanized sheets is light, and slight shading of prices is reported occasionally. Mild weather has contributed to a fairly active demand for structural material, and small orders for prompt delivery are being received by local warehouses.

Cast Iron Pipe.—Inquiries for gas

Warehouse Prices, f.o.b. New York

	Base per Lb.
Plates and structural shapes.....	3.30c.
Soft steel bars, small shapes.....	3.25c.
Iron bars.....	3.24c.
Iron bars, Swed. charcoal.....	7.00c. to 7.25c.
Cold-fin. shafting and screw stock—	
Rounds and hexagons.....	3.50c.
Flats and squares.....	4.00c.
Cold-roll. strip, soft and quarter	
hard.....	5.15c. to 5.40c.
Hoops.....	4.50c.
Bands.....	4.00c.
Blue ann'd sheets (No. 10).....	3.85c. to 3.90c.
Long term sheets (No. 24).....	5.80c.
Standard tool steel.....	12.00c.
Wire, black annealed.....	4.50c.
Wire, galv. annealed.....	5.15c.
Tire steel, 1 1/4 x 1/4 in. and larger.....	3.30c.
Smooth finish, 1 to 2 1/2 x 1/4 in.	
and larger.....	3.65c.
Open-hearth spring steel, bases.....	4.50c. to 7.00c.
	Per Cent
Machine bolts, cut thread:	Off List
3/4 x 6 in. and smaller.....	.60
1 x 30 in. and smaller.....	.50 to .50 and 10
Carriage bolts, cut thread:	
1/2 x 6 in. and smaller.....	.60
3/4 x 20 in. and smaller.....	.50 to .50 and 10
Coach screws:	
1/2 x 6 in. and smaller.....	.60
1 x 16 in. and smaller.....	.50 to .50 and 10
Boiler Tubes—	Per 100 Ft.
Lap welded, 2-in.....	\$17.33
Seamless steel, 2-in.....	20.24
Charcoal iron, 2-in.....	25.00
Charcoal iron, 4-in.....	67.00

Discounts on Welded Pipe

Standard Steel—	Black	Galv.
1/2-in. butt.....	46	29
3/4-in. butt.....	51	37
1-3-in. butt.....	53	39
2 1/2-6-in. lap.....	48	35
7 and 8-in. lap.....	44	17
11 and 12-in. lap.....	37	12
Wrought Iron—		
1/2-in. butt.....	5	+19
3/4-in. butt.....	11	+9
1-1 1/2-in. butt.....	14	+6
2-in. lap.....	5	+14
3-6-in. lap.....	11	+6
7-12-in. lap.....	3	+16

Tin Plate (14 x 20 in.)

	Prime	Seconds
Coke, 100 lb. base box...	\$6.45	\$6.20
Charcoal, per Box—	A	AAA
IC.....	\$9.70	\$12.10
IX.....	12.00	14.25
IXX.....	13.90	16.00

Terne Plate (14 x 20 in.)

IC—20-lb. coating.....	\$10.00 to \$11.00
IC—30-lb. coating.....	12.00 to 13.00
IC—40-lb. coating.....	13.75 to 14.25

Sheets, Box Annealed—Black, C. R.

	Per Lb.
Nos. 18 to 20.....	3.80c.
No. 22.....	3.95c.
No. 24.....	4.00c.
No. 26.....	4.10c.
No. 28*.....	4.25c.
No. 30.....	4.50c.

Sheets, Galvanized

	Per Lb.
No. 14.....	4.40c.
No. 16.....	4.25c.
No. 18.....	4.40c.
No. 20.....	4.50c.
No. 22.....	4.60c.
No. 24.....	4.75c.
No. 26.....	5.00c.
No. 28*.....	5.25c.
No. 30.....	5.65c.

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

pipe from public utility companies are beginning to appear and some tonnage has been closed. The American Construction & Securities Co., New York, is understood to have bought several thousand tons of water pipe and 10,000 to 15,000 tons of gas pipe for other companies is pending. Yonkers, N. Y., has closed for 300 tons of water pipe with a Birmingham maker. Quotations of Southern foundries are unchanged. Northern pipe makers show a tendency to advance prices on water pipe. On sales of gas pipe, the full \$4 to \$5 differential is not always applied and when sizable tonnages are involved the base price is sometimes slightly lower than on water pipe.

Prices per net ton deliv'd New York:
Water pipe, 6-in. and larger, \$39.60 to \$41.60; 4-in. and 5-in., \$44.60 to \$46.60; 3-in., \$54.60 to \$56.60; Class A and gas pipe, \$4 to \$5 extra.

Coke.—Demand for foundry and furnace coke is beginning to increase, but Connellsville prices are unchanged at \$3.50 to \$3.75 per net ton, ovens, for foundry and \$2.85 to \$3.05 per net ton, ovens, for furnace grade. The West Virginia producer of by-product foundry coke is renewing contracts for first half of next year at no change in price. By-product foundry coke is quoted at \$9 to \$9.40 per net ton, Newark or Jersey City, and \$10.06, New York or Brooklyn. Special brands of beehive coke are unchanged at \$4.85 per net ton, ovens, or \$8.56 per net ton, delivered to northern New Jersey, Jersey City and Newark, and \$9.44 to New York and Brooklyn.

New York Canal Shipments of Pig Iron 122,456 Tons

Total pig iron shipments from Buffalo and points westward through the New York State barge canal during the canal navigation season of 1928 were 122,456 gross tons, according to the Division of Canals and Waterways, Department of Public Works, Albany. The records of the department do not show what proportion of this tonnage originated at points other than Buffalo, but the pig iron trade understands that at least 30,000 tons of the total was shipped from Cleveland furnaces.

Smaller Production of Steel Barrels

WASHINGTON, Dec. 18.—Production of steel barrels in November totaled 563,647 units, or 48.8 per cent of operating capacity, against 656,021 barrels, or 56.4 per cent of capacity, in October, according to reports received by the Department of Commerce from 27 companies owning or operating 31 plants. Shipments were 568,353 and 661,009 barrels respectively, while stocks at the end of the months were 46,062 and 50,071 barrels respectively. Compared with last year, November showed a gain of 12 1/2

Old Material.—Consumers of scrap still show little interest in making new contracts, but prices of all grades are strong and brokers are paying up to \$15.50 per ton for No. 1 steel, delivered on \$15.50 contracts with eastern Pennsylvania mills. Meanwhile, some heavy melting steel is being shipped to Midland, Pa., at \$17.50 per ton, delivered, or \$12.20 per ton, New York. A substantial tonnage of heavy melting steel is still being exported, principally to German ports, and during the present month a total of about 6000 tons is scheduled for export to German dealers.

Dealers' buying prices per gross ton, f.o.b. New York:

No. 1 heavy melting steel.....	\$11.75 to \$12.25
Heavy melting steel (yard).....	8.50 to 9.50
No. 1 hvy. breakable cast.....	11.25 to 11.75
Stove plate (steel works).....	8.00 to 8.50
Locomotive grate bars.....	8.50
Machine shop turnings.....	7.25 to 7.50
Short shovelling turnings.....	7.25 to 7.50
Cast borings (blast furn.	
or steel works).....	6.75 to 7.00
Mixed borings and turn-	
ings.....	6.75 to 7.00
Steel car axles.....	17.00 to 17.50
Iron car axles.....	24.00 to 24.50
Iron and steel pipe (1 in.	
dia., not under 2 ft. long).....	10.75
Forge fire.....	8.00 to 8.50
No. 1 railroad wrought.....	12.25 to 12.75
No. 1 yard wrot., long.....	11.25 to 11.75
Rails for rolling.....	13.00 to 13.50
Cast iron carwheels.....	12.00 to 12.50
Stove plate (foundry).....	9.50
Malleable cast (railroad).....	10.00 to 10.50
Cast borings (chemical).....	11.25

Prices per gross ton, deliv'd local foundries:

No. 1 machry. cast.....	\$17.00
No. 1 hvy. cast (columns, bldg. ma-	
terials, etc.), cupola size.....	15.00
No. 2 cast (radiators, cast boilers,	
etc.).....	14.50

per cent in production and of 14 per cent in shipments.

Unfilled orders at the end of November, for delivery within 30 days, amounted to 319,699 barrels, compared with 301,782 barrels at the end of October. Unfilled orders at the end of November for delivery beyond 30 days were 631,798 barrels, compared with 522,090 barrels at the end of October.

Production during the 11 months ended November totaled 6,846,672 barrels, or 53.9 per cent of capacity, against 6,186,342 barrels, or 50.7 per cent of capacity, for the corresponding period of 1927. Shipments were 6,853,813 and 6,170,115 barrels respectively.

Bausch & Lomb to Offer Stock to Employees

The Bausch & Lomb Optical Co., Rochester, N. Y., has announced a plan whereby employees who have been with the company for two years or more may purchase stock in the company. The plan allows each employee to purchase preferred stock equivalent to one year's salary, on the deferred payment plan if necessary. The Bausch & Lomb organization has been a closed corporation for more than 75 years.

Pacific Coast

Diminishing Activity in Steel—Reinforcing Steel Awards in Week Total 1800 Tons

SAN FRANCISCO, Dec. 15 (*By Air Mail*).—With the approach of the holiday season and inventory taking period, activity in the Coast iron and steel markets is diminishing and few large tonnages are being placed. The greatest activity this week was in reinforcing steel, of which more than 1800 tons was booked, including 900 tons for an apartment in Los Angeles, 300 tons for a hotel at Bellingham, Wash., and 385 tons for an office building in Los Angeles.

Pig Iron.—Inquiries for and sales of foundry pig iron have not been heavy. Importations in September fell considerably below the August total. Prices are unchanged.

Prices per gross ton at San Francisco:

*Utah basic	.....	\$25.00 to \$26.00
*Utah fdy., sil.	2.75 to 3.25	..... 25.00 to 26.00
**Indian fdy., sil.	2.75 to 3.25	..... 24.00 to 25.00

*Delivered San Francisco.

**Duty paid, f.o.b. cars San Francisco.

Bars.—The price situation on out-of-stock material in Los Angeles and San Francisco continues unsettled. While mild steel merchant bars in Los Angeles and here are firm at 2.30c., c.i.f., reinforcing bars continue to be quoted around 1.80c., base. A fair volume of new business is before the trade for figures, the largest inquiry calling for 300 tons for an opera building in San Francisco. Bids on 209 tons for a bridge at Tacoma have been postponed until after the first of the year.

Plates.—The Willamette Iron & Steel Works secured the largest plate award of the week, which was 250 tons for steel outlet pipes for the Diable Dam in Seattle. The Chicago Bridge & Iron Works took 129 tons for a steel tank at Lake Youngs, Wash., and 135 tons for tanks for three companies in Tacoma. The largest pending inquiry calls for 250 tons for a tank at San Rafael, bids on which will be opened Dec. 18. Plate prices continue firm at 2.25c., c.i.f. Imports of plates on the Coast in September totaled less than 100 tons, and the aggregate so far this year has been only 736 tons.

Shapes.—While fabricators are fairly busy figuring on new work, most of which involves small tonnages, actual bookings this week were

less than 500 tons. The Judson-Pacific Co. secured 100 tons for a shop at Tiburon, Cal., for the Northwestern Pacific, and the Herrick Iron Works took 150 tons for a packing plant in Oakland. Prices on plain structural shapes from domestic mills are firm at 2.35c., c.i.f., while around 1.60c., duty paid, c.i.f., can be obtained on foreign material.

Cast Iron Pipe.—A slight increase in demand for cast iron pipe is noted, and awards this week exceeded 900 tons. Henry Sacco, Seattle, was awarded 209 tons of 8 and 12-in. Classes B and C pipe for the improvement of West Holden Street, Seattle. Los Angeles placed 548 tons of 2 to

12-in. Class B pipe for the improvement of Arlington Street with Wilbur N. Edgley, Los Angeles. The American Cast Iron Pipe Co. took 194 of 4 to 10-in. Class B pipe for the improvement of Burbank Boulevard, Burbank, Cal. New inquiries include 1350 tons of 2 to 10-in. Class B pipe for the improvement of Lomita District No. 13, Los Angeles, bids on which will be opened Jan. 7. San Diego will open bids on Dec. 31 for 144 tons of 6 and 8-in. Class B pipe for the improvement of Catocin Drive, 103 tons of 2 to 6-in. Class B pipe for the improvement of Meade Avenue and 140 tons of 4 to 16-in. Class B pipe for the improvement of Taylor Street. That city is also asking for figures direct on 324 tons of 6-in. Classes B and C pipe. Imports of cast iron pipe for September totaled 1440 tons, compared with 2174 tons in August and 2301 tons in September, 1927.

St. Louis

Pig Iron Sold for Second Quarter—Demand for Sheets Keeps Mills at Full Rate

ST. LOUIS, Dec. 18.—The first sale of pig iron for second quarter delivery by the St. Louis Gas & Coke Corporation was made last week; it was 1000 tons of foundry iron to a machinery manufacturer at the price prevailing now. Other sales by this maker during the week, which was marked by quite a slump in buying, included 300 tons of malleable to an Illinois melter, 200 tons of foundry grades to a stove plant, and 100 tons to a Kansas City engine builder. The Granite City maker blew in its second furnace on Tuesday, having had it closed down for several months for relining and other repairs. Its shipments so far this month have averaged more than 400 tons a day in excess of those in the same month last year. Melters in the district are expected to be closed a shorter period than usual for the holidays on account of a heavy order file.

Prices per gross ton at St. Louis:

No. 2 fdy., sil.	1.75 to 2.25, f.o.b.
Granite City, Ill.	.....\$20.00
Malleable, f.o.b. Granite City	..... 20.50
N'th'n No. 2 fdy., deliv'd St. Louis	..... 22.16
Southern No. 2 fdy., deliv'd	..... 20.92
Northern malleable, deliv'd	..... 22.16
Northern basic, deliv'd	..... 22.16

Freight rates: 81c. (average) Granite City to St. Louis; \$2.16 from Chicago; \$4.42 from Birmingham.

Coke.—The buying of domestic coke has picked up considerably, and the demand of dealers outside of St. Louis has enabled local by-product ovens to reduce their stock piles. Colder weather also has resulted in much heavier buying by local dealers. Foundry coke business is good.

Finished Iron and Steel.—The Granite City Steel Co. is now operating at full capacity on black, galvanized and blue annealed sheets, the demand for

these items holding up remarkably well. There is a seasonal lull in the demand for tin plate, in which production is at about 80 per cent of capacity. Plates are dull, although demands from car builders are expected to be considerable after the first of the year. Business in structural steel fabrication is confined almost entirely to small jobs. The Missouri Highway Commission let highway contracts Friday which will require about 1000 tons of reinforcing bars.

Old Material.—The market for old materials is quiet, and there has been no buying of anything except a few specialties by the mills for several weeks, nor is there likely to be any buying movement until after the first of the year. However, the market is firm. No. 2 heavy melting and shoveling steel are 25c. higher, and machine shop turnings are 50c. higher.

Warehouse Prices, f.o.b. St. Louis

	Base per Lb.
Plates and struc. shapes	..... 3.25c.
Bars, soft steel or iron	..... 3.15c.
Cold-fin. rounds, shafting, screw stock	..... 3.75c.
Black sheets (No. 24)	..... 4.10c.
Galv. sheets (No. 24)	..... 4.95c.
Blue ann'l'd sheets (No. 10)	..... 3.45c.
Black corrug. sheets (No. 24)	..... 4.15c.
Galv. corrug. sheets	..... 5.00c.
Structural rivets	..... 3.75c.
Boiler rivets	..... 3.75c.

Per Cent Off List

Tank rivets, $\frac{7}{8}$ -in. and smaller, 100 lb. or more	..... 65
Less than 100 lb.	..... 60
Machine bolts	..... 60
Carriage bolts	..... 60
Lag screws	..... 60
Hot-press. nuts, sq., blank or tapped, 200 lb. or more	..... 60
Less than 200 lb.	..... 50
Hot-press. nuts, hex., blank or tapped, 200 lb. or more	..... 60
Less than 200 lb.	..... 50

Warehouse Prices, f.o.b. San Francisco

	Base per Lb.
Plates and struc. shapes	..... 3.15c.
Soft steel bars	..... 3.15c.
Small angles, $\frac{3}{8}$ -in. and over	..... 3.15c.
Small angles, under $\frac{3}{8}$ -in.	..... 3.55c.
Small channels and tees, $\frac{3}{4}$ -in. to 2 $\frac{3}{4}$ -in.	..... 3.75c.
Spring steel, $\frac{1}{4}$ -in. and thicker	..... 5.00c.
Black sheets (No. 24)	..... 5.00c.
Blue ann'l'd sheets (No. 10)	..... 4.00c.
Galv. sheets (No. 24)	..... 5.40c.
Struc. rivets, $\frac{1}{2}$ -in. and larger	..... 5.65c.
Com. wire nails, base per keg	..... \$3.40
Cement c't'd nails, 100 lb. keg	..... 3.40

Otherwise the list is unchanged. Railroad lists: Louisville & Nashville, 6152 tons; Atchison, Topeka & Santa Fe, 5300 tons; Chicago, Burlington & Quincy, 4145 tons; Chesapeake & Ohio, 3548 tons; International-Great Northern, 650 tons; Frisco Lines, 15 carloads; Pullman Co., 11 carloads; Nickel Plate, 8 carloads; Chicago, Milwaukee, St. Paul & Pacific, 5 carloads.

Dealers' buying prices, per gross ton, f.o.b. St. Louis district:

No. 1 heavy melting or shoveling steel	.....	\$12.50 to \$13.00
No. 2 heavy melting or shoveling steel	.....	12.25 to 12.75
No. 1 locomotive tires	.....	14.50 to 15.00
Miscel. stand.-sec. rails including frogs, switches and guards, cut apart	.....	15.00 to 15.50
Railroad springs	.....	16.25 to 16.75
Bundled sheets	.....	9.50 to 10.00
No. 2 railroad wrought	.....	13.25 to 13.75
No. 1 bushing	.....	9.50 to 10.00
Cast iron borings	.....	8.75 to 9.25
Iron rails	.....	13.50 to 14.00
Rails for rolling	.....	15.50 to 16.00
Machine shop turnings	.....	9.50 to 10.00
Steel car axles	.....	19.50 to 20.00
Iron car axles	.....	27.00 to 27.50
Wrot. iron bars and trans.	.....	22.00 to 22.50
No. 1 railroad wrought	.....	12.50 to 13.00
Steel rails, less than 3 ft.	.....	17.50 to 18.00
Steel angle bars	.....	14.25 to 14.75
Cast iron carwheels	.....	14.50 to 15.00
No. 1 machine cast	.....	15.50 to 16.00
Railroad malleable	.....	15.00 to 15.50
No. 1 railroad cast	.....	14.00 to 14.50
Stove plate	.....	12.50 to 13.00
Agricult. malleable	.....	11.50 to 12.00
Relay. rails, 60 lb. and under	.....	20.50 to 23.50
Relay. rails, 70 lb. and over	.....	26.50 to 29.00

The Abrasive Co., Philadelphia, manufacturer of grinding wheels and supplies, held its annual sales conference in that city, Dec. 3 to 5. The program, which was under the direction of S. M. Hershey, sales manager, included an inspection of the new factory at Bridesburg and a grinding demonstration in the company's mechanical laboratory.

New Extras on Wire Rods Announced Dec. 7

Extras on wire rods have been revised under date of Dec. 7. Compared with the former list, dated March 1, 1928, only the carbon extras have been changed, and in this case it is chiefly an extension of the range limits.

The list of extras follows:

	Extra per Gross Ton
Less than carload, but not less than 5 tons of a size	\$2.00
Less than carload and less than 5 tons of a size	4.00
Cleaned, line-coated and baked	2.50
Annealed	5.00
Screw stock	5.00
Special rods (low in all elements, not exceeding 0.30% in all impurities)	20.00
CARBON EXTRAS	
When maximum of carbon range is 0.08%.....	3.00
When maximum of carbon range is reduced below 0.08%, add per point carbon	1.00
When maximum of carbon is 0.09 to 0.13%.....	Base
When minimum of carbon range is 0.20 to 0.40%.....	3.00
When minimum of carbon range is 0.41 to 0.55%.....	5.00
When minimum of carbon range is 0.56 to 0.75%.....	7.50
When minimum of carbon range is 0.76 to 0.90%.....	10.00
When minimum of carbon range is 0.91 to 1.00%.....	15.00

The above carbon extras to apply when other elements are in normal proportion.

A minimum carload of rods is 25 gross tons. When shipped in less than carload quantities the freight rate on wire applies.

HOT-ROLLED RODS STRAIGHTENED AND CUT IN 2 TO 24-FT. LENGTHS

No. 5 gage and heavier—25c. per 100 lb. extra to be added to base price of hot-rolled rods in coils reduced to 100 lb. basis. Longer lengths than 24 ft. can be furnished, but at additional expense. The bar steel rate of freight is added to make a delivered price on straightened and cut rods either on carloads or less-than-carload lots.

Birmingham

Cast Iron Pipe Order for 24,000 Tons Awarded—Steel Business in Good Volume

BIRMINGHAM, Dec. 18.—Pig iron sales were light during the past week. This was not unexpected, in view of the heavy buying movement of the few weeks preceding, during which first quarter requirements were largely covered. Current sales are all spot, with orders ranging from 50 to 150 tons. One company is taking spot business at \$17, while the others quote \$16.50, base, for foundry iron. Shipments have eased off slightly owing to the usual holiday lull, but the strength they have shown for the month so far has been sufficient to reduce stocks to the low point of the year. Stocks on the yards of one company are equal to about three weeks make at the present rate. No changes in furnace operations have occurred during the past three weeks. Nine furnaces are on foundry, eight on basic, one on ferro-manganese and one on recarburizing iron.

Prices per gross ton, f.o.b. Birmingham dist. furnaces:

No. 2 fdy., 1.75 to 2.25 sil.	\$16.50 to \$17.00
No. 1 fdy., 2.25 to 2.75 sil.	17.00 to 17.50
Basic	16.50

Finished Steel.—Prices on bars, plates and shapes are firm at 2.15c. Sheet demand is strong, with prices the same as for the past several weeks. Both inquiries and new business continue to develop at a good rate. Mills will begin the new year with better schedules than in any recent year. Structural steel fabricating shops are operating on full schedules, with a large tonnage in prospect. The Alabama State Bridge Corporation has placed contracts in this district for approximately 3680 tons of reinforcing bar steel. Open-hearth operations are the highest of the year, with the Tennessee company working

nine at Ensley, eight at Fairfield, and the Gulf States Steel Co. four at Alabama City.

Cast Iron Pipe.—The American Cast Iron Pipe Co. has been awarded a contract by Knoxville, Tenn., for 400 tons of cast iron pipe. The United States Cast Iron Pipe & Foundry Co. has received an order for 125 tons of 10-in. pipe for Memphis, Tenn. The Dallas, Tex., project requiring approximately 24,000 tons, reported in these columns last week, has been definitely awarded to this company. The only inquiry of consequence was for 3000 tons for Detroit. Gas line syndicates and water companies are estimating next year's requirements. Plants are securing a few small orders from day to day. Quotations are \$37 to \$38 on 6 in. and larger sizes.

Coke.—Demand for foundry coke is fair, in view of the large amount of first quarter coke under contract. No second quarter coke is being sold. Considerable coke is being shipped outside the district. Prices are unchanged.

Old Material.—Sales to foundries have been gradually easing up in the past two weeks owing to lighter operations and approaching inventories. Steel mills continue to take scrap in fairly good quantities.

Prices per gross ton, deliv'd Birmingham dist. consumers' yards:

Heavy melting steel	.....	\$12.50
Scrap steel rails	.....	\$12.00 to 12.50
Short shoveling turnings	8.00 to	8.50
Cast iron borings	.....	8.00
Stove plate	.....	12.50
Steel axles	.....	19.00 to 20.00
Iron axles	.....	21.00 to 22.00
No. 1 railroad wrought	.....	10.00 to 10.50
Rails for rolling	.....	14.00 to 15.00
No. 1 cast	.....	15.00
Tramcar wheels	.....	13.00 to 14.00
Cast iron carwheels	.....	13.00 to 13.50
Cast iron borings, chem.	.....	13.50 to 14.00

Pearlitic Iron Castings to Be Made at Newark

The manufacture of pearlitic iron castings will be begun early next year at the plant of the Eastern Steel Castings, Newark, N. J., according to a statement of its president, W. D. Sargent, who has just returned from a visit to Germany.

While there he secured from the large German firms of Heinrich Lanz, Mannheim; A. Borsig, Berlin, Thyssen, Gelsenkirchen, and the Esslingen Machine Works, the American sales right for this process, which, it is understood, is now being extensively used abroad. Licenses have been reported given to 45 companies for the manufacture of this metal in Germany, England, France, Holland, Italy, Switzerland, Rumania, Denmark, Sweden and Japan. The product by this special process is known as "Perlite" castings.

Buffalo

Bethlehem Announces First Quarter Prices—Its Operations at Lackawanna Reduced to 60 Per Cent

BUFFALO, Dec. 18.—Only small orders for pig iron were booked by local furnaces during the past week. Most of the larger consumers are covered for the first quarter. It is estimated that not more than 20 per cent of the first quarter requirements is still to be purchased. The Bethlehem Steel Co. has taken off one blast furnace, reducing its active total from seven to six. Three other furnaces may go in before the first of the year or soon after—one Hanna, one Donner and the Tonawanda stack of the American Radiator Co.

Prices per gross ton, f.o.b. furnace:

No. 2 fdy., sil. 1.75 to 2.25	\$18.00 to \$18.50
No. 2X fdy., sil. 2.25 to 2.75	18.50 to 19.00
No. 1X fdy., sil. 2.75 to 3.25	19.50 to 20.00
Malleable sil. up to 2.25	18.50 to 19.00
Basic	17.50 to 18.00
Lake Superior charcoal	27.28

Finished Steel.—The Bethlehem Steel Co. has announced that first quarter prices for bars, shapes and plates will be 2c. to 2.10c., Lackawanna. The minimum presumably is to apply on contracts with large buyers, but it is a reduction of \$1 a ton from the prices at which many first quarter contracts had been made by other producers. Operations at the Lackawanna plant of the Bethlehem company have dropped during the past week to about 60 per cent; 15 of the 24 open-hearths are active. Some sizable structural projects are pending, including a new warehouse for the Cleveland & Buffalo Transit Co., but tonnage figures are not yet available.

Old Material.—The principal transaction of what otherwise was a light week was the purchase of 9000 to 10,000 tons of No. 1 machinery cast and stove plate at prices reported to be \$5 and \$14.50, respectively. This purchase will probably take the buyer out of the market for about two months on these commodities. One of the mills has suspended further shipments, and the chances are it will not resume until after the first of the year. The largest buyer is expected to come in shortly. There is considerable competition among dealers for No. 1 heavy melting steel, No. 2 heavy melting steel, hydraulic compressed sheets and machine shop turnings for Pittsburgh and Youngstown delivery. A very active demand exists for blast furnace scrap to apply on orders taken for delivery to local furnaces. A shortage exists for No. 1 heavy melting steel and it is likely

Warehouse Prices, f.o.b. Buffalo

Base per Lb.	
Plates and struc. shapes	3.40c.
Soft steel bars	3.30c.
Reinforcing bars	2.75c.
Cold-fin. flats, sq. and hex.	4.45c.
Rounds	3.95c.
Cold rolled strip steel	5.85c.
Black sheets (No. 24)	4.20c.
Galv. sheets (No. 24)	4.85c.
Blue ann'd sheets (No. 10)	3.50c.
Com. wire nails, base per keg	\$3.60
Black wire, base per 100 lb.	3.75

that the next large purchase will be at 50c. over present prices. Some sales of knuckles and couplers at prices ranging between \$17.50 and \$18.50 are reported.

Prices per gross ton, f.o.b. Buffalo consumers' plants:

Basic Open-Hearth Grades	
No. 1 heavy melting steel	\$15.50 to \$16.50
No. 2 heavy melting steel	13.25 to 14.00
Scrap rails	15.50 to 16.00
Hydraulic comp. sheets	13.50
Hand bundled sheets	12.00 to 12.50
Drop forge flashings	13.00 to 13.75
No. 1 busheling	14.50 to 15.50
Hvy. steel axle turnings	13.50 to 14.00
Machine shop turnings	7.50 to 8.00
No. 1 railroad wrought	12.50 to 13.00
Acid Open-Hearth Grades	
Knuckles and couplers	17.50 to 18.50
Coil and leaf springs	17.50 to 18.00
Rolled steel wheels	17.00 to 17.50
Low phos. billet and bloom ends	18.00 to 18.50
Electric Furnace Grades	
Short shov. steel turnings	11.00 to 11.50
Blast Furnace Grades	
Short shov. steel turnings	11.00 to 11.50
Short mixed borings and turnings	11.00 to 11.50
Cast iron borings	11.00 to 12.00
No. 2 busheling	9.00 to 9.50
Rolling Mill Grades	
Steel car axles	18.75 to 19.25
Iron axles	21.00 to 22.00
Cupola Grades	
No. 1 machinery cast	15.00 to 15.50
Stove plate	14.50 to 14.75
Locomotive grate bars	13.00 to 13.50
Steel rails, 3 ft. and under	17.50 to 18.00
Cast iron carwheels	13.00 to 13.50
Malleable Grades	
Industrial	16.00 to 16.50
Railroad	16.00 to 16.50
Agricultural	16.00 to 16.50

Canada

Pig Iron Buyers Covering for First Quarter

TORONTO, ONT., Dec. 18.—Renewed interest has developed in pig iron. Advance contract placing was strongly featured in transactions of the week. First quarter business already closed is estimated at close to 20,000 tons, and inquiries are out for a still larger tonnage for shipment up to the end of March. Despite the fact that there has been considerable talk of higher prices, no advance has gone into effect. First quarter contracts are being closed at the same prices as on iron for immediate delivery.

Prices per gross ton:

Delivered Toronto	
No. 1 fdy., sil. 2.25 to 2.75	\$23.60
No. 2 fdy., sil. 1.75 to 2.25	23.60
Malleable	23.60
Delivered Montreal	
No. 1 fdy., sil. 2.25 to 2.75	25.00
No. 2 fdy., sil. 1.75 to 2.25	25.00
Malleable	25.00
Basic	24.00
Imported Iron, Montreal Warehouse	
Summerlee	33.50
Carron	33.00

Old Material.—Numerous inquiries are appearing for old material for delivery to the end of the year. Some first quarter buying also is reported, but so far only a few of the larger consumers have come into the market.

Heavy melting steel and turnings are moving freely to consumers in the Hamilton, Ont., district. Foundries are buying machinery cast, malleable scrap and stove plate more extensively. Montreal dealers report a stronger demand for wrought iron and steel axles, and there is also more demand for heavy melting steel for export. Toronto and Montreal prices are firm but unchanged.

Dealers' buying prices:

Per Gross Ton		
	Toronto	Montreal
Heavy melting steel	\$9.50	\$7.00 to \$7.50
Rails, scrap	10.00	9.00
No. 1 wrought	9.00	11.00 to 11.50
Machine shop turnings		
Ings	7.00	5.00
Boiler plate	7.00	6.00
Heavy axle turnings	7.50	6.50
Cast borings	7.50	5.00
Steel turnings	7.00	5.50
Wrought pipe	5.00	5.00
Steel axles	14.00	20.00
Axles, wrought iron	16.00	22.00
No. 1 machinery cast		16.00 to 17.00
Stove plate		13.00
Standard carwheels		16.00
Malleable		13.00
Per Net Ton		
No. 1 machinery cast	15.00	
Stove plate	9.00	
Standard carwheels	13.00	
Malleable scrap	13.00	

Detroit

December Lull Becomes More Pronounced

DETROIT, Dec. 18.—The December lull becomes very pronounced, as indicated by a falling off last week of 3473 in the labor barometer of the Detroit Employers' Association. Previous to last week, the weekly decrease was only about 2500. This condition is usual for this time of year, and is due largely to inventory taking and readjustments for new models.

The Ford Motor Co., during the first year of manufacture of the new model, has sold 704,699 units. The first week of this month showed a daily production of 6435 units, an increase of 400 units a day over the first week of November. Total November production was 121,037 cars and trucks. The estimates for 1929 production are being based on a record of 2,100,000, the 1924 peak. At least 1,800,000 cars and trucks are expected to be sold in the United States and Canada.

The scrap market has shown a slightly stronger tone during the past week, with heavy melting and shoveling steel and hydraulic compressed registering advances of 50c. per ton.

Dealers' buying prices per gross ton, f.o.b. cars, Detroit:

Hvy. melting and shov. steel	\$13.50 to \$14.00
Borings and short turnings	9.00 to 9.50
Long turnings	8.50 to 9.00
No. 1 machinery cast	14.00 to 15.00
Automobile cast	19.00 to 20.50
Hydraulic comp. sheets	12.75 to 13.25
Stove plate	11.00 to 12.00
No. 1 busheling	11.00 to 11.50
Sheet clippings	8.00 to 8.50
Flashings	11.50 to 12.00

Boston

Good Cast Iron Pipe Business Is in the Making—Buffalo Iron Prices Mixed

BOSTON, Dec. 18.—Pig iron sales in this territory the past week were the smallest for any similar period in months. The largest sales by any furnace were less than 3200 tons. In the aggregate, bookings did not run more than 4500 tons. A Vermont foundry, inquiring for 1000 tons No. 2X first quarter iron, withdrew from the market. The Buffalo price situation is mixed. Most of the furnaces in that district are holding to \$18 a ton, furnace, for No. 2 plain and \$18.50 a ton for No. 2X. One stack, however, has accepted and is soliciting business at \$17.50 a ton, base furnace, and within the last day or two another furnace has solicited business on the same base, but so far as known has made no bookings. Buffalo No. 1X iron is openly quoted at \$19.50 a ton on cars furnace, but offers of \$19 have been common of late. Requests for deferred shipments on contract iron so far this month have been fewer than in any December for many years.

Foundry iron prices per gross ton deliv'd to most New England points:

*Buffalo, sil. 1.75 to 2.25...	\$22.41 to \$22.91
*Buffalo, sil. 2.25 to 2.75...	22.91 to 23.41
East. Penn., sil. 1.75 to 2.25...	24.15 to 24.65
East. Penn., sil. 2.25 to 2.75...	24.65 to 25.15
Va., sil. 1.75 to 2.25.....	26.91
Va., sil. 2.25 to 2.75.....	27.41
Ala., sil. 1.75 to 2.25.....	23.41 to 25.77
Ala., sil. 2.25 to 2.75.....	23.91 to 26.27

Freight rates: \$4.91 all rail from Buffalo; \$3.65 from eastern Pennsylvania; \$5.21 all rail from Virginia; \$6.91 to \$8.77 from Alabama.

*All rail rate.

Coke.—New England by-product coke makers have not only caught up with contract specifications, but are pushing foundries for anticipated wants. Melters, however, are specifying only as requirements necessi-

tate. Indications are New England foundries will go into 1929 with more business on their books than on Jan. 1 in any recent year. Foundry coke remains at \$11 a ton, delivered within a \$3.10 freight rate zone.

Cast Iron Pipe.—The outlook for pipe business before Jan. 1 is bright. One of the largest New England utility companies is inquiring for 4000 tons, and it is expected at least two and possibly three others will place substantial tonnages this month. Salem, Mass., has awarded 100 tons of 12-in. pipe to the National Cast Iron Pipe Co., the first New England business placed with an Alabama foundry since early in 1928. New Bedford, Mass., has placed 100 tons of pipe with the United States Cast Iron Pipe & Foundry Co. Kingston, Mass., has yet to close on 200 tons. Private business is exceptionally good for December. Boston will close bids at noon, Dec. 26, on 2000 tons of pipe, consisting of 1000 8-in., Class B, 150 tons of 10-in., 500 tons of 12-in., and 350 tons of 16-in. The city is also calling for bids on 30 tons of special 24-in. to 48-in. castings and approximately 668 tons of various water department castings. Prices quoted openly on pipe are: 4-in., \$47.10 to \$48.10 a ton, delivered common Boston freight rate points; 6-in. and larger, \$44.10 to \$45.10. Differentials of \$3 and \$4 a ton are asked on Class A and gas pipe.

Fabricated Steel.—The fabricated steel market is quiet. The outlook is encouraging, however. Approximately 6000 tons of steel has been figured and several 1000 and 2000-ton jobs will come up for bids within the next fortnight.

Warehouse Business.—In addition to the recent advance of \$2 a ton in local warehouse prices on wire nails, a similar rise is noted on other wire

products, such as barbed wire, cable, staples, etc. Instead of curtailing business, the new prices have bolstered up buying. Bars, structural steel, plates, bands and kindred mill products have moved out of warehouses so far this month in much larger volume than a year ago. Further, there is comparatively little price cutting, except with preferred customers and on moderately large contracts.

Old Material.—Higher scrap prices in the Pittsburgh territory are reflected here. The movement of material out of New England is somewhat larger than a week ago. The market is by no means active, however. Quite an improvement in forge scrap values is noted, and this material is leading in activity. Early in the week, sales at \$7.50 a ton, on cars shipping point, were reported; since then sales at \$8 to \$8.50 a ton have been made. Most current business in mixed borings and turnings is at \$6 a ton, on cars, but occasionally brokers add 5c. or 10c. a ton. The market for heavy melting steel and steel mill borings is easily 25c. a ton higher, and rails for re-rolling are up 50c. a ton on limited transactions. Railroad wrought is quoted higher, yet there appears to be little sale for the material. Scattering sales of axles are reported at former prices.

Buying prices per gross ton, f.o.b. Boston rate shipping points:

No. 1 heavy melting steel.....	\$11.00 to \$11.50
Scrap T rails.....	10.50 to 11.00
Scrap girder rails.....	10.00 to 10.25
No. 1 railroad wrought.....	11.50 to 12.00
No. 1 yard wrought.....	9.00 to 9.50
Machine shop turnings.....	6.25 to 6.50
Cast iron borings (steel works and rolling mill).....	6.00 to 6.25
Bundled skeleton, long.....	9.00 to 9.25
Forge flashings.....	9.00 to 9.50
Blast furnace borings and turnings.....	5.75 to 6.10
Forge scrap.....	7.50 to 8.00
Shafting.....	13.00 to 13.50
Steel car axles.....	16.00 to 16.50
Wrought pipe 1 in. in diameter (over 2 ft. long).....	9.50 to 10.00
Rails for rolling.....	11.50 to 12.00
Cast iron borings, chemical.....	10.00 to 10.25

Prices per gross ton deliv'd consumers' yards:

Textile cast.....	\$14.00 to \$14.50
No. 1 machinery cast.....	15.00 to 15.50
No. 2 machinery cast.....	13.00 to 13.50
Stove plate.....	11.00 to 11.50
Railroad malleable.....	15.50 to 16.75

Warehouse Prices, f.o.b. Boston

Base per Lb.

Plates.....	3.365c.
Structural shapes—	
Angles and beams.....	3.365c.
Tees.....	3.365c.
Zees.....	3.465c.
Soft steel bars, small shapes.....	3.265c.
Flats, hot-rolled.....	4.15c.
Reinforcing bars.....	3.265c. to 3.54c.
Iron bars—	
Refined.....	3.265c.
Best refined.....	4.60c.
Norway rounds.....	6.60c.
Norway, squares and flats.....	7.10c.
Spring steel—	
Open-hearth.....	5.00c. to 10.00c.
Crucible.....	12.00c.
Tie steel.....	4.50c. to 4.75c.
Bands.....	4.015c. to 5.00c.
Hoop steel.....	5.50c. to 6.00c.
Cold rolled steel—	
Rounds and hex.....	*3.55c. to 5.55c.
Squares and flats.....	*4.05c. to 7.05c.
Tee calk steel.....	6.00c.
Rivets, structural or boiler.....	4.50c.
Machine bolts.....	50 and 5
Carriage bolts.....	50 and 5
Lag screws.....	50 and 5
Hot-pressed nuts.....	50 and 5
Cold-punched nuts.....	50 and 5
Stove bolts.....	70 and 10

*Including quantity differentials.



Wrought Iron Co. Formed; Charles Hart, President

The Wrought Iron Co. of America, embracing the Lebanon Iron Co., Lebanon, Pa., and the Scranton Bolt & Nut Co., Scranton, Pa., merger of which was announced last August, has been incorporated under the laws of Pennsylvania. Authorized capital stock of the new company is 1,250,000 shares of 7 per cent cumulative preferred stock with \$100 par value and 265,000 shares of common stock of no par value.

The president of the new company is Charles Hart, who is also president of the Delaware River Steel Co., Chester, Pa. On the board of directors are: A. A. Corey, Jr., Vanadium Corporation of America; Burrows

Sloan, president General Refractories Co.; Charles P. Lineweaver, vice-president Bank of North America & Trust Co., Philadelphia; Frank Hummler, Scranton National Bank, Scranton, Pa.; Howard Longstreth, formerly president Lebanon Iron Co.; Thomas D. Smith, Harrison, Smith & Co., bankers, Philadelphia; T. H. McKoy, Jr., Kidder, Peabody & Co., New York, and C. B. Hibbard.

Wide grooves, giving large chip area, and shearing cut, with graduated taper, are features of a spiral three-groove structural reamer which has been placed on the market by the Morse Twist Drill & Machine Co., New Bedford, Mass. The tool is designed for service under difficult conditions.

Cincinnati

Advance on Tennessee Pig Iron Does Not Hold—Sheet Mills Busy—Scrap Strengthens

CINCINNATI, Dec. 18.—After advancing its price to \$17, base Birmingham, a week ago, a Tennessee melter again is soliciting business at \$16.50. The reestablishment of the former schedule came as a result of the failure of Alabama producers, with one exception, to raise their prices above \$16.50. Local brokers have participated in the market to the greatest extent in several years. They have been active in selling small lots of Valley iron to Ohio and Indiana consumers and also have purchased practically all of the remaining stock of the Marting Iron & Steel Co., Ironton, Ohio. They are reselling the southern Ohio iron at \$18.50 to \$19, base furnace, an advance of 50c. a ton from previous quotations. Northern Ohio furnaces have such substantial order books that they are reported to be inactive so far as the solicitation of fresh orders in this territory is concerned. Sales in the past week have amounted to about 4000 tons. Bookings included 1000 tons of Northern foundry for a Kokomo, Ind., company, 1000 tons for a central Ohio melter and 500 tons for a Hamilton, Ohio, user.

Prices per gross ton, deliv'd Cincinnati:
So. Ohio fdy., sil. 1.75 to 2.25
Ala. fdy., sil. 1.75 to 2.25... \$20.39 to \$20.89
Ala. fdy., sil. 2.25 to 2.75... 20.19 to 20.69
Tenn. fdy., sil. 1.75 to 2.25... 20.69 to 21.19
S'th'n Ohio silvery, 8 per cent... 20.19 to 27.89 to 28.89

Freight rates, \$1.89 from Ironton and Jackson, Ohio; \$3.69 from Birmingham.

Coke.—Movement of by-product foundry coke has held up surprisingly well this month, but a considerable decrease in shipments is expected during the remainder of December on account of the approaching inventory period. Despite unfavorable weather, domestic grades have been in fair demand. While no announcement has been made by district makers, by-product foundry coke probably will remain at \$7, ovens, during January, whereas all domestic sizes will go up 50c. a ton. A local dealer has closed an order with a Wisconsin melter for

6000 tons of Wise County beehive foundry coke to be delivered during the first half of next year.

Finished Material.—Sheet steel specifications have continued in liberal volume and have been sufficiently diversified to insure operation of district mills at 100 per cent of capacity during the remainder of the year. Demand from automobile makers has picked up somewhat and a further increase in bookings from the Detroit district is expected the coming week. Jobbers have been taking moderate tonnages of sheets, while electrical equipment manufacturers have been buying freely. In the South, the roofing season has been fairly good, although considerable price shading on galvanized sheets is reported. The new schedule of quotations is holding well, with blue annealed selling at 2.10c., base Pittsburgh, black at 2.85c., galvanized at 3.60c. and automobile body sheets at 4.10c. Common wire nails have gone up \$2 a ton and now are quoted at \$2.79 per keg, delivered Cincinnati, or \$2.65, Ironton. Bars, shapes and plates are steady

at 1.90c. to 2c., base Pittsburgh, but sales have been light.

Old Material.—The scrap market has an underlying tone of strength, which has had a stimulating effect on prices. Heavy melting steel has advanced 25c. a ton, and cast iron borings and machine shop turnings are also higher than a week ago. Increased demand for malleable scrap has forced dealers to pay 50c. a ton more for railroad and agricultural malleable. Railroads are reported to have obtained from 25c. to 45c. a ton more for their material this month than in November. While users are buying little at the moment, inquiries are plentiful and indications are that the market will be active immediately after the turn of the year.

Dealers' buying prices per gross ton, f.o.b. cars, Cincinnati:

Heavy melting steel.....	\$13.25 to \$13.75
Scrap rails for melting....	13.25 to 13.75
Loose sheet clippings.....	9.50 to 10.00
Bundled sheets	10.25 to 10.75
Cast iron borings.....	9.75 to 10.25
Machine shop turnings....	9.00 to 9.50
No. 1 busheling.....	11.00 to 11.50
No. 2 busheling.....	7.00 to 7.50
Rails for rolling	14.00 to 14.50
No. 1 locomotive tires....	14.00 to 14.50
No. 2 railroad wrought....	13.25 to 13.75
Short rails	19.00 to 19.50
Cast iron carwheels....	12.50 to 13.00
No. 1 machinery cast.....	18.50 to 19.00
No. 1 railroad cast.....	15.00 to 15.50
Burnt cast	10.00 to 10.50
Stove plate	10.00 to 10.50
Brake shoes	10.25 to 10.75
Railroad malleable	14.75 to 15.25
Agricultural malleable	13.75 to 14.25

Germany to Export Steel Houses

HAMBURG, GERMANY, Dec. 1.—A company is being formed in Germany to export steel houses. The staff of the new export organization will include engineers familiar with steel dwellings of all types and able to advise foreign buyers as to the most satisfactory design for their purposes.

Cast Iron Pipe Freight Rates Justified

WASHINGTON, Dec. 18.—Passing upon a complaint of the Krupp Foundry Co., Lansdale, Pa., Attorney-Examiner Howell, in a proposed report announced today, recommended that the Interstate Commerce Commission find that rates on cast iron pipe, in carloads, from Lansdale and Quakertown, Pa., to New York Harbor and northern New Jersey stations are not unreasonable. Dismissal of the complaint was proposed. The rates to New York and Jersey City are \$1.70 and \$1.80 per net ton, respectively.

Tutein-Hudson Valley Case Begun and Postponed

Hearings in the arbitration proceedings between E. Arthur Tutein, Inc., Boston, and the Hudson Valley Coke & Products Corporation, Troy, N. Y., involving an alleged breach of contract for the sale of pig iron and coke, were begun on Monday, Dec. 17, in the trial room of the

New York Bar Association's building at 42 West Forty-fourth Street, continued for one day and then were postponed until Dec. 26 because United States Senator Wagner, arbitrator for the Hudson Valley company, announced that he must go to Washington to attend the sessions of the Senate. Sherman Whipple, Boston, is arbitrator for E. Arthur Tutein, Inc., and the third arbitrator, appointed by Charles M. Schwab, as president of the American Iron and Steel Institute, is Louis K. Comstock of New York.

Duff Mfg. Co. Acquires A. O. Norton, Inc.

The Duff Mfg. Co., Pittsburgh, has acquired the business and assets of A. O. Norton, Inc., Moline, Ill., and its Canadian subsidiary, A. O. Norton, Inc. Both companies are in the manufacture of industrial and railroad jacks and have a substantial drop forgings business. A new company, the Duff-Norton Mfg. Co., has been formed with former Duff company officials holding the principal offices.

Czechoslovakia Keeps Machinery on Free List

HAMBURG, GERMANY, Dec. 1.—The Czechoslovakian list of duty-free machines has been extended to the end of 1929, except for tractors, which are reported to be produced in sufficient numbers domestically to satisfy present requirements.

Warehouse Prices, f.o.b. Cincinnati

	Base per Lb.
Plates and struc. shapes.....	3.40c.
Bars, soft steel or iron.....	3.30c.
New billet reinforce. bars.....	3.15c.
Rail steel reinforce. bars.....	3.00c.
Hoops	4.00c. to 4.25c.
Bands	3.95c.
Cold-fin. rounds and hex.....	3.85c.
Squares	4.35c.
Black sheets (No. 24).....	3.90c.
Galvanized sheets (No. 24).....	4.75c.
Blue ann'd sheets (No. 10).....	3.45c.
Structural rivets	3.85c.
Small rivets .....	.65 per cent off list
No. 9 ann'd wire, per 100 lb.....	\$3.00
Com. wire nails, base per keg.....	2.95
Cement c'd nails, base 100 lb. keg..	2.95
Chain, per 100 lb.....	7.55
Net per 100 Ft.	
Lap-weld. steel boiler tubes, 2-in....	\$18.00
4-in.	38.00
Seamless steel boiler tubes, 2-in....	19.00
4-in.	39.00

Non-Ferrous Metal Markets

Copper Firm and Quiet, Tin Moderately Active and Easy, Lead and Zinc Steady with Sales Light

NEW YORK, Dec. 18.

Copper.—Because of a desire to keep down stocks and also because of the approach of inventories, domestic consumers are not active buyers. However, there have been some good purchases the past week, the largest having been 1400 net tons by the Western Union Telegraph Co. Most of the buying is for February delivery with a little for March and some for January. Foreign buying has been light and it is estimated that consumers abroad must still buy about two-fifths of their January and four-

THE WEEK'S PRICES. CENTS PER POUND FOR EARLY DELIVERY

	Dec. 18	Dec. 17	Dec. 15	Dec. 14	Dec. 13	Dec. 12
Lake copper, New York.....	16.12½	16.12½	16.12½	16.12½	16.12½	16.12½
Electrolytic copper, N. Y.*.....	15.75	15.75	15.75	15.75	15.75	15.75
Straits tin, spot, N. Y.....	49.62½	49.37½	49.37½	49.62½	49.85	49.75
Lead, New York.....	6.50	6.50	6.50	6.50	6.50	6.50
Lead, St. Louis.....	6.35	6.35	6.35	6.35	6.35	6.35
Zinc, New York.....	6.70	6.70	6.70	6.70	6.70	6.70
Zinc, St. Louis.....	6.35	6.35	6.35	6.35	6.35	6.35

*Refinery quotation; delivered price ¼c. higher.

fifths of their February requirements. Prices continue very firm at 16c., delivered in the Connecticut Valley, and 16.25c., c.i.f. usual European ports, for electrolytic copper. No changes in these prices are indicated for the immediate future. Production has increased considerably and statistics for November show that stocks of copper, in the refined and blister condition, increased about 10,000 tons over October, with about 6500 tons of this in the refined form. Specifications on contract are reported exceedingly heavy, with all December metal being regularly taken. Demand for Lake copper is satisfactory with prices firm at 16c. to 16.12½c., delivered.

Tin.—In a quiet market, sales of Straits tin amounted to about 1000 tons for the week ended Saturday, Dec. 15. Purchases were confined to nearby or December-January delivery,

with consumers taking about one-half of the total. As is usual at this time of the year, the market is becoming quieter and thus far this week very little business is reported. Today spots Straits tin was quoted at 49.62½c., New York, and prices in London were somewhat lower than a week ago, with spot standard quoted at £224 17s. 6d., future standard at £223 17s. 6d., and spot Straits at £225. The Singapore market today was £226 15s.

Lead.—Following the heavy buying recently, the market has turned quiet, but sales in the last two days have been fairly substantial at the firm price of 6.35c., St. Louis. The deliveries involved have been mostly January, with some December metal, but sales for February have been very light. Producers are in a very comfortable position and are not in-

Metals from New York Warehouse

Delivered Prices Per Lb.

Tin, Straits pig.....	52.00c. to 53.00c.
Tin, bar.....	54.00c. to 55.00c.
Copper, Lake.....	17.00c.
Copper, electrolytic.....	16.75c.
Copper, casting.....	16.00c.
Zinc, slab.....	7.50c. to 8.00c.
Lead, American pig.....	7.50c. to 8.00c.
Lead, bar.....	9.50c. to 10.00c.
Antimony, Asiatic.....	12.00c. to 13.00c.
Aluminum No. 1 ingots for re-melting (guar'nt'd over 99% pure).....	25.00c. to 26.00c.
Alum. ingot, No. 12 alloy.....	24.00c. to 25.00c.
Babbitt metal, commerc'l grade.....	30.00c. to 40.00c.
Solder, ½ and ¼.....	33.00c. to 34.00c.

Metals from Cleveland Warehouse

Delivered Prices Per Lb.

Tin, Straits pig.....	54.50c.
Tin, bar.....	56.50c.
Copper, Lake.....	17.00c.
Copper, electrolytic.....	17.00c.
Copper, casting.....	16.75c.
Zinc, slab.....	8.00c.
Lead, American pig.....	7.00c. to 7.25c.
Lead, bar.....	9.75c.
Antimony, Asiatic.....	16.00c.
Babbitt metal, medium grade.....	19.25c.
Babbitt metal, high grade.....	58.50c.
Solder, ½ and ¼.....	33.75c.

Rolled Metals from New York or Cleveland Warehouse

Delivered Prices, Base Per Lb.

Sheets—	
High brass.....	26.25c.
Copper, hot rolled.....	25.00c.
Copper, cold rolled, 14 oz. and heavier.....	26.25c.
Seamless Tubes—	
Brass.....	26.12½c.
Copper.....	26.00c.
Brass Rods.....	26.25c.
Brass Tubes.....	26.00c.

From New York Warehouse

Delivered Prices, Base Per Lb.

Zinc sheets (No. 9).....	18.00c. to 19.00c.
Machine rods.....	11.00c. to 11.50c.
Zinc sheets, open.....	11.00c. to 11.50c.

Non-Ferrous Rolled Products

Brass and copper mill prices have not changed since Oct. 29. Zinc sheets have been quoted at 9.75c., base, since July 30, and lead full sheets at 10.25c. to 10.50c. since Nov. 15.

List Prices, Per Lb., f.o.b. Mill

On Copper and Brass Products, Freight up to 75c. per 100 Lb. Allowed on Shipments of 500 Lb. or Over

Sheets—	
High brass.....	20.50c.
Copper, hot rolled.....	25.00c.
Zinc.....	9.75c.
Lead (full sheets).....	10.25c. to 10.50c.
Seamless Tubes—	
High brass.....	25.37½c.
Copper.....	26.37½c.

Rods—	
High brass.....	18.25c.
Naval brass.....	20.25c.

Wire—	
Copper.....	17.87½c.
High brass.....	21.00c.
Copper in Rolls.....	24.00c.
Brass in Rolls.....	28.50c.

Aluminum Products in Ton Lots

The carload freight rate is allowed to destinations east of Mississippi River and also to St. Louis on shipments to points west of that river.

Sheets, 6 to 10 gage, 3 to 30 in. wide.....	23.00c.
Tubes, base.....	42.00c.
Machine rods.....	34.00c.

Old Metals, Per Lb., New York

Buying prices represent what large dealers are paying for miscellaneous lots from smaller accumulators and selling prices are those charged customers after the metal has been properly prepared for their uses.

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible.....	12.75c.	15.00c.
Copper, hvy. and wire.....	13.50c.	14.50c.
Copper, light and bottoms.....	11.50c.	12.75c.
Brass, heavy.....	7.75c.	9.00c.
Brass, light.....	6.50c.	7.50c.
Hvy. machine composition.....	10.50c.	11.50c.
No. 1 yel. brass turnings.....	9.25c.	10.00c.
No. 1 red brass or compos. turnings.....	9.75c.	10.75c.
Lead, heavy.....	5.125c.	5.625c.
Lead, tea.....	3.75c.	4.25c.
Zinc.....	3.25c.	3.75c.
Sheet aluminum.....	13.00c.	15.00c.
Cast aluminum.....	11.75c.	13.50c.

Rolled Metals, f.o.b. Chicago Warehouse

(Prices Cover Trucking to Consumers' Doors in City Limits)

	Base per Lb.
Sheets—	
High brass.....	26.50c.
Copper, hot rolled.....	25.00c.
Copper, cold rolled, 14 oz. and heavier.....	27.25c.
Zinc.....	10.00c.
Lead, wide.....	10.55c.
Seamless Tubes—	
Brass.....	26.87½c.
Copper.....	27.87½c.
Brass Rods.....	18.25c.
Brass Tubes.....	28.50c.

clined to force the market. The contract price of the American Smelting & Refining Co. is unchanged at 6.50c., New York.

Zinc.—Purchasing of prime Western was so heavy in November that producers are in a somewhat independent position so that, with demand rather light at present, quotations continue decidedly firm at 6.35c., East St. Louis, or 6.70c., New York, for delivery through the first quarter. Consumers, however, have considerable metal yet to buy for that period. Interest in the ore market continues unabated, with the ore price unchanged at \$40, Joplin. Stocks were further reduced last week by about 5500 tons, with the total now estimated at about 38,600 tons. On Nov. 3 stocks were a little over 57,800 tons. Ore output is being curtailed, the estimate for last week being about 12,500 tons, with sales at 13,320 tons and shipments at a little over 17,900 tons. The last two items were a little less than the preceding week, but are regarded as impressive.

Antimony.—Demand for Chinese metal is light, but quotations are a little higher at 9.87½c., duty paid, New York, for all positions.

Nickel.—Wholesale lots of ingot and shot nickel for this and next year's delivery are unchanged at 35c. and 36c., respectively. Electrolytic nickel is held at 37c. for this year's delivery, but for 1929 the quotation will be on the same basis as for ingot and shot nickel.

Aluminum.—Virgin metal, 98 to 99 per cent pure, is quoted at 23.90c. per lb., delivered.

Non-Ferrous Markets at Chicago

CHICAGO, Dec. 18.—This market is quiet, with prices unchanged except for tin. Specifications for all grades are lighter. The old-metal market is without feature.

Prices, per lb., in carload lots: Lake copper, 16.25c.; tin, 50.50c.; lead, 6.45c.; zinc, 6.45c.; in less-than-carload lots: antimony, 10.75c. On old metals we quote copper wire, crucible shapes and copper clips, 12.50c.; copper bottoms, 11.25c.; red brass, 10.75c.; yellow brass, 8.25c.; lead pipe, 5c.; zinc, 3.50c.; pewter, No. 1, 27c.; tin foil, 27c.; block tin, 39c.; aluminum, 12c., all being dealers' prices for less-than-carload lots.

New Steel Corporation Directors Elected

At a meeting of the board of directors of the United States Steel Corporation held on Dec. 18, Junius S. Morgan, Jr., of J. P. Morgan & Co., and Walter S. Gifford, president of the American Telephone & Telegraph Co., were made directors of the corporation succeeding the late William P. Palmer and John S. Phipps, who has retired. Thomas W. Lamont, who was elected to the board earlier in the year, was made a member of the finance committee.

Railroad Equipment

Boston & Maine Orders 500 Hopper Cars

OUTSTANDING orders placed during the week were 500 hopper cars for the Boston & Maine, 200 automobile cars for the Chicago & Eastern Illinois and 200 composite gondola cars for the Great Northern. The Louisville & Nashville has placed 24 locomotives. Inquiries included 250 gondola cars for the Elgin, Joliet & Eastern. Details of the week's business follow:

Boston & Maine has ordered 500 steel hopper cars from Standard Steel Car Co.

Chicago & Eastern Illinois has ordered 200 automobile cars from Mount Vernon Car & Mfg. Co.

Great Northern has ordered 200 composite gondola cars from Pressed Steel Car Co. and six dining cars from Pullman Car & Mfg. Corporation, and is inquiring for six gas-electric cars.

Fruit Growers Express has ordered 196 refrigerator car underframes from Ryan Car Co. This company has yet to pur-

chase 800 underframes through its subsidiary, Western Fruit Express.

Pacific Fruit Express has ordered 600 refrigerator car underframes from Pacific Car & Foundry Co.

Akron, Canton & Youngstown has ordered four air-dump cars from Magor Car Corporation.

International Railways of Central America are inquiring for 25 stock cars.

United Fruit Co. has ordered 50 cane cars from Magor Car Corporation.

Elgin, Joliet & Eastern is inquiring for 250 70-ton gondola cars and 75 flat car bodies.

Chicago, South Shore and South Bend has ordered two caboose cars from American Car & Foundry Co.

New York Central is inquiring for 22 steel coaches, five steel observation coaches and four smoking cars, all 70 ft. long.

Chicago & North Western is inquiring for 10 70-ft. baggage cars.

Louisville & Nashville has ordered 24 locomotives from Baldwin Locomotive Works.

Chicago, Rock Island & Pacific is now asking for eight gas-electric cars instead of six.

Reinforcing Steel

Awards of 4400 Tons—3650 Tons in New Projects

AWARDS of 4400 tons, reported to THE IRON AGE in the last week, included no jobs of outstanding size. Among the projects to take 3650 tons were a group of State hospital buildings at Orangeburg, N. Y., which will require 1000 tons. Awards follow:

NEW YORK, 400 tons, subway section 4, route 106; from Slattery-Baino & Co., general contractors, to National Bridge Works.

PHILADELPHIA, 500 tons, warehouse at Sixth Street and Glehwood Avenue, to American Steel Engineering Co.

AKRON, OHIO, 400 tons, Goodyear-Zepelin Co. hangar, to Hardware & Supply Co., West Virginia Rail Co. to furnish the steel.

OAK PARK, ILL., 100 tons, school, to Concrete Steel Co.

CHICAGO, 400 tons, apartment building, to Concrete Steel Co.

CHICAGO, 100 tons, Harlem Avenue bridge, to Concrete Engineering Co.

CHICAGO, 250 tons, apartment building near Loyola Station, to Concrete Engineering Co.

CHICAGO, 100 tons, naval armory, to Concrete Engineering Co.

CHICAGO, 125 tons, Jorgenson apartments, to Concrete Engineering Co.

CHICAGO, 100 tons, Nurses' Home for city of Chicago, to Concrete Engineering Co.

BELLINGHAM, WASH., 300 tons, hotel, to Northwest Steel Rolling Mills.

SACRAMENTO, CAL., 188 tons, crossing at Benham, to unnamed interest.

LOS ANGELES, 385 tons, office building, Eighth and Hill Streets, to unnamed interest.

LOS ANGELES, 900 tons, apartment building, 414 North Rossmore Boulevard, to unnamed interest.

LOS ANGELES, 120 tons, hospital, Glendale Boulevard, to unnamed interest.

Reinforcing Bars Pending

Inquiries for reinforcing steel bars include the following:

NEW YORK, 250 tons, New York State Hospital building.

ORANGEBURG, N. Y., 1000 tons, several buildings for New York State Hospital; Niewenhaus Co., general contractor.

JERSEY CITY, 150 tons, Margaret Maternity Hospital.

WEST NEW YORK, N. J., 100 tons, manufacturing building for Brinkerhoff Electric Co.; Auf-Der-Heide Construction Co., general contractor.

DOVER, N. J., 240 tons, buildings for Picatinny Arsenal; bids in.

APPLE CREEK, OHIO, 200 tons, buildings for the Ohio Institute for Feeble Minded.

CINCINNATI, 144 tons, library at University of Cincinnati.

CINCINNATI, 200 tons, Loretta Guild.

HAMILTON, OHIO, 193 tons, Hamilton High School.

WOLF POINT, MONT., 121 tons, Missouri River bridge; bids Dec. 19.

TACOMA, WASH., 209 tons, Tacoma Avenue bridge; bids postponed.

SAN FRANCISCO, 300 tons, foundations for War Memorial; bids Jan. 5.

LOS ANGELES, 160 tons, apartment building, South Detroit Street; bids being received.

LOS ANGELES, 190 tons, apartment building, Occidental Avenue; bids being taken.

SAN FRANCISCO, 191 tons, paving Laguna Honda Boulevard; bids Dec. 26.

PERSONAL

H. A. HOUSTON has been appointed works manager of the R. D. Nuttall Co., Pittsburgh, maker of Westinghouse-Nuttall gears, and a subsidiary of the Westinghouse Electric & Mfg. Co. Mr. Houston is a graduate in mechanical engineering of Purdue University, and a post-graduate of the railroad department of the University of Illinois. Before joining the Westinghouse company he had been engaged in mechanical and engineering capacities with the St. Louis-San Francisco and the Chicago, Rock Island & Pacific railroads. Since 1920 he has been manager of mechanical parts, railroad equipment engineering department, Westinghouse company. During the World War, he was a major in the Engineers Corps.

HERBERT C. RYDING, vice-president Tennessee Coal, Iron & Railroad Co., Birmingham, has been elected president of the recently organized Birmingham Board of Industrial Development.

JOHN E. KELLEY, general sales manager Simonds Saw & Steel Co., Fitchburg, Mass., will retire from that position on Dec. 31, after an association of 33 years with the company. He began as a salesman and was later advanced to branch manager and finally general sales manager and secretary. At present Mr. Kelley plans a rest at his Florida home, 740 Beach Drive, St. Petersburg.

W. E. LEWIS, recently resident manager at the Anniston, Ala., plant of the United States Cast Iron Pipe & Foundry Co., has been made resident manager for the company at Addyston, Ohio, succeeding the late CHARLES SEITZ.

C. E. FOUST, vice-president and general sales manager of the Kentucky Fire Brick Co., Chicago, has been appointed representative of the Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., in the Chicago district, with headquarters at 208 South LaSalle Street.

F. J. PHILLIPS, for several years with the Concrete Steel Co. at Boston, is representing the General Fireproofing Co., Youngstown, in the Philadelphia territory.

HENRY C. OSBORN, president American Multigraph Co., Cleveland, has been appointed chief of the Cleveland Ordnance District of the United States Army, succeeding COL. FRANK A. SCOTT, chairman of the board of the Warner & Swasey Co., who recently resigned. ALEX C. BROWN, president Industrial Brownhoist Corporation, Cleveland, has been made assistant ordnance chief of the district. Colonel

Scott has been appointed on Mr. Osborn's advisory committee, which also includes SAMUEL MATHER, chairman, and HENRY G. DALTON, both of Pickands, Mather & Co., JAMES A. CAMPBELL, president Youngstown Sheet & Tube Co. and ALLYN F. HARVEY, president Pittsburgh Steamship Co.

WILLIAM W. SWAYZE, formerly plant manager for the American Manganese Steel Co., New Castle, Del., and previously associated with the Taylor-Wharton Iron & Steel Co., High Bridge, N. J., has been made superintendent of the Deemer Steel Casting Co., New Castle, Del. After Jan. 1 the Deemer company will be



W. W. SWAYZE

equipped to manufacture manganese steel castings and will continue its production of carbon and alloy steel castings as heretofore.

F. H. BUTTERFIELD has been appointed chief engineer of the Laclede Steel Co., St. Louis, succeeding H. H. WOOD, who has resigned.

HARRY SCULLIN, president Scullin Steel Co., St. Louis, and EARL C. BROWN, vice-president and general manager Mississippi Valley Structural Steel Co., St. Louis, have been elected to the board of directors of the Merchants and Manufacturers Association of that city.

H. J. KELLEY, for five years general manager of steel plants for the British Empire Steel Corporation, Ltd., Sydney, N. S., and previously associated for many years with the Lackawanna Steel Co., Buffalo, has been appointed general manager of the British Empire corporation, with headquarters at Sydney. He will be in charge of all the company's activities, including coal mines, railroads,

docks and steamships, and succeed J. E. McLURG, vice-president, who has been transferred to the Montreal office. F. W. GRAY, for five years assistant to the president, with headquarters at Montreal, who has been in the service of the company for 24 years, has been appointed assistant general manager, with office at Sydney.

CHARLES L. RICE, manager Hawthorne works, Western Electric Co., Inc., Chicago; WILLIAM H. MEESSE, manager of the company's Point Breeze plant, Baltimore, and S. S. HOLMES, of the Kearny works, Kearny, N. J., have been elected vice-presidents of the company.

M. H. LUND, Middletown, Ohio, will be in charge of a foreign office to be opened on Jan. 1 at Oslo, Norway, by the Bureau of Foreign and Domestic Commerce, Department of Commerce.

LEROY P. ROBINSON, New England representative of the Sterling Wheelbarrow Co., Milwaukee, has resigned to become sales manager of the Werner G. Smith Co., Cleveland. He will be succeeded by RAY HUNTER, for many years with White & Brother, Inc., Philadelphia, and the Niagara Falls Smelting & Refining Co. Mr. Hunter will retain his association with the White organization.

D. C. CURTIS, purchasing agent for the Chicago, Milwaukee, St. Paul & Pacific railroad, was the guest of the New England Railroad Club on Dec. 11, at Boston, and discussed the budget system in railroad administration.

H. M. LANE, president of the H. M. Lane Co., Detroit, was the guest of the New England Foundrymen's Association at the Exchange Club, Boston, on Dec. 12. He discussed recent improvements in melting of iron, his talk being accompanied by illustrations. Later he exhibited sample castings and told of methods employed in making them and results obtained in stress, machinability, etc. At a business meeting preceding Mr. Lane's address, H. P. BLUMENAUER, Arcade Malleable Iron Co., Worcester, Mass.; HENRY S. CHAFFEE, Builders Iron Foundry, Providence, R. I., and R. F. HARRINGTON, Hunt-Spiller Mfg. Corporation, South Boston, were appointed to a nominating committee for officers to be elected at the association's annual meeting on Jan. 9. CHARLES A. REED, Rogers, Brown & Crocker Brothers, Inc., Boston, was made chairman of the entertainment committee for the annual meeting. The association, cooperating with the Associated Brass Founders of New England, voted to tender a dinner on Dec. 19, at the Engineer's Club, to LEROY P. ROBINSON, Sterling Wheelbarrow Co., Boston, who is to locate shortly in Cleveland.

Obituary

WILLIAM CHASE GREENE, vice-president and works manager of the Builders Iron Foundry, Providence, R. I., died in that city on Dec. 13, following a long illness. He was born at Marietta, Ga., Dec. 16, 1852.

EDWARD PRESTON CLIFFORD, vice-president Bell Telephone Laboratories, Inc., New York, died at his home in that city on Dec. 17, aged 53 years. He became associated with the Western Electric Co., Inc., 35 years ago and in 1911 was made manager of the New York office. In 1917 he became Eastern district manager, and the following year, office manager of the company's engineering department. When the Bell Telephone Laboratories were incorporated in 1925 he was elected vice-president.

GEORGE F. HUTCHINS, for many years general superintendent of the Crompton & Knowles Loom Works, Worcester, Mass., died Dec. 12, aged 87 years. He was widely known as a mechanic and as an inventor in the development of weaving, particularly in connection with the fancy loom. He was born at Hepburn, Pa., but later moved to East Douglas, Mass., and learned his trade in the works of the Douglas Axe Co.

OTTO J. DORN, manager of the Automatic Sprinkler Co., Chicago, died suddenly Dec. 12 at his office in that city, aged 65 years.

Chrome-Tungsten Steel Excellent at High Temperatures

(Concluded from page 1556)

in. in 400 hr. but remained substantially constant at that figure after 600 hr.

L. W. Spring, Crane Co., Chicago, confirmed the good report on this steel by describing his "long-draw" tests. He places round samples in drilled holes in a cast iron block, and heats them continuously at 900 deg. Fahr., testing them for hardness at given intervals, and inferring a change in related properties from the change in hardness. An 8 per cent chromium, 8 per cent tungsten steel with 0.60 per cent carbon gave 590 Brinell when quenched. After 300 hr. at 900 deg. Fahr. the Brinell increased to 630, which figure was maintained for 1800 hr. more, then it gradually fell to 510 after a total time of 2900 hr. (4 months).

The same alloy with 0.30 per cent carbon acted similarly, but the decrease in hardness started 500 hr. earlier, and it fell faster. Mr. Spring thought that White and Clark neglected high-speed steel, which gives good high-temperature service. No decrease in hardness occurs after 2100 hr. at 900 deg. C. Also he cited the austenitic steels containing 24 per cent nickel and 7 to 17 per cent chro-

mium which will not creep more than 1 per cent in one year at working loads and temperatures. It should also be remembered that large grain size is probably desirable for steels for this duty, despite the fact that fine grain is associated with toughness at atmospheric temperatures. In other words, a casting may resist loads better than a forging at and above 900 deg. Fahr.

Milwaukee Forms Chapter of Welding Society

Temporary organization of a Milwaukee chapter of the American Welding Society has been effected through the efforts of S. H. Smith, manager Milwaukee branch Universal Oxygen Co., at a meeting attended by 37 representatives of 22 Milwaukee companies engaged in the industry. I. A. McIntyre, Milwaukee Steel Foundry Co., is temporary president, and W. E. Van Dreser, local manager C. H. Hollup Corporation, temporary secretary. A permanent organization will be made at a second meeting on Dec. 18. D. W. Lunn of Chicago, who addressed the organization meeting, declared that Milwaukee might soon claim the distinction of being the welding center of America because of

the remarkable work accomplished by the A. O. Smith Corporation and other plants. Six plants in Milwaukee manufacture welding equipment, and a much larger number use it.

To Build Memorial Bridge Machinery

Contract for the operating trunnion and lock machinery for the Arlington Memorial Bridge has been awarded to Gears & Forgings, Inc., Cleveland, by the Phoenix Bridge Co., Phoenixville, Pa., the general contractors. This bridge, which will span the Potomac River at Washington, is a Straus double-leaf bascule draw span. Each leaf is driven by two motors through inclosed herringbone reducing and equalizing double reduction gear units and the lock mechanism drive is through inclosed worm gear reductions. All gears, including the main operating rack, have cut teeth.

Operating machinery for two double-leaf bascule bridges of the Wadell Hardesty type, one of which will span the Northeast River and the other the Cape Fear River at Wilmington, N. C., is also being built by Gears & Forgings, Inc. This contract was awarded by the Vincennes Bridge Co., Vincennes, Ind.

New Trade Publications

Excavating Equipment.—Marion Steam Shovel Co., Marion, Ohio.—Four bulletins devoted to different types of excavators of 1½ and 2-yard capacity. Bulletin 334, 16 pages, illustrates and describes type 480 with electric rheostatic control. This is on a crawler tread and has a 2-yard bucket. Bulletin 335 of 16 pages illustrates the same type with Ward-Leonard control. Bulletin 336, 16 pages, illustrates the same type of excavator, but with steam operation rather than electric. Bulletin 337 illustrates and describes type 450 with gas-electric operation. The gas engine runs on constant speed, driving a d.c. generator and providing current for three motors.

Ingot Molds.—Gathmann Engineering Co., Baltimore.—Booklet of 30 pages, entitled "Big End Up vs. Big End Down." It illustrates and describes molds of various designs and shows sections of ingots cast in them. An argument is made for the use of molds with the big end up and recommendations are made as to best methods of handling molds in practice.

Ventilation for Air Painting Booths.—Paasche Airbrush Co., 1923 Diversey Parkway, Chicago.—Folder describing and illustrating an explosion-proof ventilating unit for an air-finishing booth. This is made in four sizes and for either a.c. or d.c. service.

Non-Corroding Pumps.—E. F. Doty Pump Co., 401 Ellicott Square, Buffalo.—Folder describing centrifugal pumps particularly adapted to handle corrosive and viscous fluids and semi-solids. They can be equipped with

impellers of non-clogging type to handle solids in suspension and stringy or fibrous substances.

Texrope Drives.—Allis-Chalmers Mfg. Co., Milwaukee. Bulletin 1228-H of 16 pages illustrates and describes the use of belts of trapezoidal cross section for handling drives where the centers are close together. Most of those illustrated are multiple. The power is transmitted by the wedging contact between the belts and the V-shaped grooves.

Induction Motors.—Allis-Chalmers Mfg. Co., Milwaukee. Bulletin 1118-E of 16 pages illustrates and describes a line of polyphase induction motors of the sleeve and roller bearing types, built with steel frames. Many details of construction are shown.

Metal Edge Boxes.—National Metal Edge Box Co., Philadelphia. 28-page booklet of special shape showing the superiority of packages made with metal reinforcement strips at vertical corners, and containing a discussion of other factors which enter the problem of rugged packing boxes.

Furnace Insulation.—Celite Products Co., New York. Bulletin 108, containing 30 sectional drawings and 20 exterior views of electric and fuel-fired furnaces for diverse heat treating and baking operations.

Bearing Metal.—Invincible Bearing Metals Corporation, Sandusky, Ohio. Folder describing performance of "Eureka Metallon" bearings, made of leady bronze, so processed that the lead is uniformly dispersed in unusually fine particles.

Machinery Markets and News of the Works

Outlook Continues Promising

Some Let-up in Machine Tool Buying This Month but Increase Is Expected in the First Quarter

MACHINE tool buying has declined somewhat this month, as was to be expected, but the falling off is smaller than usual for the last month of the year. At Chicago sales have been on a par with those of the two previous months. The large amount of business in prospect assures a good first quarter business, barring untoward developments.

Aircraft companies are expected to become a more important factor in machine tool buying. The Curtiss Aeroplane & Motor Co., Buffalo, has bought 12 milling machines and other tools; the Glenn L. Martin Co., which has sold its Cleveland plant and will equip a new plant on the Eastern seaboard, has bought about \$35,000 worth of tools, and the Sperry Gyroscope Co., Brooklyn, has bought a number of tools. A great many aircraft and engine-building plants contemplate expansion during 1929. The Wright Aeronautical Corporation, Paterson, N. J., has announced that it will build Gypsy airplane motors for a light plane at some point in the Middle West.

New York

NEW YORK, Dec. 18.—Business in machine tools is still good, although the approach of the holidays has apparently caused some curtailment in the volume of new inquiry. Increases in prices of about 10 per cent have been made by some builders and others are reported considering similar price advances. No action on its list of tools has been taken by the New York, New Haven & Hartford Railroad, but the New York Central is still buying and closed on some tools the past week. The General Electric Co., Schenectady, continues an active buyer, closing on several pieces of equipment recently and has inquiries in the market for a number of tools, including three lathes, a screw machine and milling machine.

Railroad buying shows signs of improving. The Missouri Pacific and the Cotton Belt have each ordered several machines at St. Louis; the Southern has bought the tools on a recent list, and the Norfolk & Western still has some to order against an inquiry issued early in the fall. The New York, New Haven & Hartford has received bids on a list.

Export business is gaining, and the machine tool industry looks for substantial orders from abroad during the coming year. One Cincinnati company is reported to have orders on its books for \$250,000 worth of tools for France, as well as sizable orders from Germany and Italy.

The National Machine Tool Builders' Association reports that orders continued their upward trend during November, making the twelfth consecutive month of progressive increase. The association sees no signs of a recession for months to come, although a seasonal slackening may be looked for this month.

The Austin Mfg. Co., Harvey, Ill., has issued a sizable list.

No fresh buying by local aircraft manufacturers is reported, but the Curtiss Aeroplane & Motor Co., Buffalo, continues to buy against a list of machine tools estimated to be close to \$250,000, and is understood to have closed on a number of milling machines. The Sperry Gyroscope Co., Brooklyn, has bought a number of tools, including several lathes.

Recent sales by Niles Tool Works included a steam hammer, carwheel borer, carwheel lathe, journal turning and axle lathe, boring mill and three engine lathes. Machinery department of company reports sale of one radial drill, six grinders, six engine lathes, a bolt cutter, upright drill, milling machine, screw machine, gate shear and power hack saw. Pratt & Whitney Co. has booked orders recently for 11 sensitive and deep-hole drilling machines, 13 engine lathes, four vertical surface grinders, six jig boring machines, three profilers, three die sinkers, two bench lathes and a bench milling machine.

Pure Oil Co., 420 Lexington Avenue, New York, has plans for two-story storage and distributing plant at New Rochelle, N. Y., to cost about \$40,000 with equipment.

National Lead Co., 111 Broadway, New York, has taken bids on general contract for one-story unit, 120 x 175 ft., at Brooklyn, to cost about \$200,000 with equipment. William Higginson, 101 Park Avenue, New York, is architect and engineer.

American Sugar Refining Co., 117 Wall Street, New York, is reported arranging addition to refinery at New Orleans, to cost more than \$150,000 with equipment.

Maxwell Schantz, 25 Spruce Street, New York, architect, has plans for two-story automobile service, repair and garage building on West Thirty-fifth Street, Brooklyn, to cost about \$100,000 with equipment.

Central Supply Co., 255 Pearl Street, New York, manufacturer of plumbing and heating equipment, is said to have plans for new plant at Radburn, a new industrial settlement near Paterson, N. J., to cost more than \$50,000 with equipment.

Schnell Penselpen Corporation, 130 West Forty-second Street, New York, manufacturer of a combination fountain pen and pencil, has purchased property at Arlington, N. J., for new plant, to cost more than \$70,000 with machinery.

Acme Metal Goods Mfg. Co., 2 Orange Street, Newark, manufacturer of metal products for domestic service, has purchased property, 60 x 100 ft., at Nassau Boulevard and 215th Street, Queens, L. I., for new factory.

John Polachek and other officials of Polachek Bronze & Iron Co. and Renaissance Bronze & Iron Co., affiliated organizations, both with plants at Long Island City, have organized Polachek Bronze & Iron Corporation and Renaissance Bronze & Iron Corporation, to take over and expand present companies. Erwin R. Geiger will be an official of both companies.

Electric Servidor Corporation, 147 West Twenty-ninth Street, New York, manufacturer of electric service specialties, has leased part of building at 357-9 Ogden Street, Newark, for branch plant to manufacture electric roasting machines.

Best Mfg. Co., 1200 Grove Street, Irvington, N. J., manufacturer of electrical and radio equipment, has awarded general contract to Kiegel & Spieler, Irvington, for two-story addition, 35 x 127 ft., to cost about \$40,000 with equipment. V. H. Strombach, 1234 Springfield Avenue, is architect.

Morrison Machine Co., 204 Van Houten Street, Paterson, N. J., manufacturer of textile machinery and parts, has acquired about 2½ acres, with one-story building of about 100,000 sq. ft. of floor space, from American Locomotive Co., for new factory for increase in output.

Kullman Dining Car Builders, Inc., 61 Empire Street, Newark, Samuel Kullman, president, has acquired two-story factory at Frelinghuysen Avenue and Queen

Street, 50 x 300 ft., for expansion. It is understood present works will be removed to new location.

F. H. Koenigsberger, 48 Walnut Street, Newark, architect, will soon take bids on general contract for three-story automobile service, repair and garage building at Kearny, to cost about \$100,000 with equipment.

Rhodia Chemical Co., Jersey Avenue, New Brunswick, N. J., manufacturer of patented wire glass, etc., is planning construction of two one-story additions, to cost more than \$35,000 with equipment.

Paramount Welded Aluminum Products Corporation, Brooklyn, manufacturer of airplane fuel and oil tanks, engine cowlings, pilot seats and other aircraft products, has removed from 429 Kent Avenue to 195 Morgan Avenue. Company has recently purchased shop materials, machines, tool stands and other equipment. J. Billig is president.

New England

BOSTON, Dec. 17.—The past week was quiet with the majority of machine tool dealers. Several thousand dollars worth of heavy production tools were sold by a Boston dealer to Vermont manufacturers, and a used tool dealer shipped a 16-in. x 8-ft. lathe, a large number of hand millers and miscellaneous bench equipment. New England machine tool builders are busy, some maintaining night shifts. A shortage of skilled workers still exists.

Small tools are selling freely, December sales greatly exceeding those for the same period last year.

Cone Automatic Machine Co., Windsor, Vt., has started work on an addition.

Walter Atherton and Carroll Tiffany, architects, 148 State Street, Boston, have closed bids for a two-story trade high school at Medford, Mass., to cost \$125,000 without equipment. P. S. Ferguson is chairman of building committee.

Frank B. Perry, 44 Franklin Street, Providence, architect, closed bids Dec. 15 for a two-story and basement, 60 x 400 ft. jewelry manufacturing plant for Cohn & Rosenberger, Inc., Providence.

Ernest J. Batty, 13 Temple Street, Quincy, Mass., closed bids Dec. 15 on a one-story and basement school addition, 32 x 64 ft., at Braintree, Mass., to contain a manual training department.

Reed-Prentice Corporation, Worcester, Mass., has recently added to its machine shop equipment four Warner & Swasey and two Gisholt turret lathes, one Bickford and one Carlton 5-ft. radial drills, and a number of other machine tools. Considerable new foundry equipment has also been purchased.

Bird & Son, Inc., Washington Street, East Walpole, Mass., manufacturer of roofing, has asked bids on general contract for one-story addition, including improvements in present unit, to cost about \$45,000 with equipment.

Indian Motorcycle Co., Springfield, Mass., is said to be arranging to use part of plant for production of new type of aircraft motors, including parts and assembling.

Rhode Island Malleable Iron Works, Hills Grove, R. I., has purchased plant and business of Rhode Island Fittings Co., Providence, and will consolidate with organization. Merged company will have a capital of \$1,000,000 and plans expansion.

The Crane Market

IN the past week to 10 days there has been an increase in the number of inquiries for overhead cranes, especially electric and hand power equipment of small capacity. One of these inquiries asks for prices on eight small hand power and electric cranes and another recent request for prices is from the American Enka Corporation, 114 East Thirty-second Street, New York, in the market for a 10-ton hand power and a 20-ton electric traveling crane for a plant at Asheville, N. C. Business in locomotive cranes continues limited.

In the New England district, Stone & Webster, Inc., Boston, is inquiring for a 100-ton electric overhead crane for the Puget Sound Electric Railway.

Among recent sales are:

Sutton & Suderly Brick Co., Coeymans, N. Y., 2-ton, 30-ft. span, 3-motor overhead crane from Shepard Electric Crane & Hoist Co.

New England Gas & Electric Association, Worcester, Mass., is disposing of bond issue of \$6,000,000, part of proceeds to be used for extensions and improvements, including transmission lines.

Central Maine Power Co., Augusta, Me., is completing plans for construction of hydroelectric generating plant on Kennebec River, near Bingham, Me., with initial output of 60,000 hp., to cost more than \$500,000 with transmission system.

Bridgeport Brass Co., Bridgeport, Conn., is said to be planning new one-story unit, to cost over \$75,000 with equipment.

Acme Metal Treating Co., Inc., 108 Beachview Avenue, Bridgeport, Conn., has been organized to engage in metal treating, including pack, die, high-speed steel cyanide hardening and annealing. Company's charter also calls for machine shop which will be installed at some future time.

Pittsburgh

PITTSBURGH, Dec. 17.—The prospect for the early part of next year is exceptionally bright. Steel manufacturers have taken up projects that they have had in blueprints for a year or more and builders of rolling mills are counting on some heavy releases after the turn of the year. These programs will mean purchases of machine tools and of cranes. At least 11 cranes will be wanted for the Youngstown Sheet & Tube Co. Indiana Harbor improvements, while another large lot will be wanted in the new construction of the A. M. Byers Co.

Liberty Dairy & Products Co., New Kensington, Pa., plans rebuilding part of machine shop and ice plant, destroyed by fire Dec. 7.

Spang, Chalfant & Co., Inc., Union Bank Building, Pittsburgh, manufacturer of pipe, tubing, etc., has asked bids on general contract for one-story addition to plant at Etna, 240 x 800 ft., to cost more than \$400,000 with equipment.

Libbey-Owens Sheet Glass Co., Charleston, W. Va., has asked bids on general contract for additions in cutting division at branch plant at Kanawha, W. Va., to cost more than \$80,000 with equipment.

W. A. Harriman & Co., 39 Broadway, New York, bankers, have acquired S. R. Dresser Mfg. Co., Bradford, Pa., manufacturer of pipe couplings, sleeves, fittings, etc. New company has been organized under same name and stock issue of \$4,800,000 is being sold, part of fund to be used for expansion. Fred A. Miller is president.

United States Chromium Corporation, Wilkesburg, Pa., has plans for one-story plant unit, 75 x 100 ft., to cost over \$50,000 with equipment.

Philadelphia

PHILADELPHIA, Dec. 17.—Contract has been let by Thomas S. Gassner Co., 4545 Wayne Avenue, Philadelphia, manufacturer of metal sash, etc., to John N. Gill Construction Co., 121 North Broad Street, for two-story addition, to cost about \$45,000 with equipment.

Board of Education, Keystone Building, Philadelphia, is asking bids until Jan. 3 for steel lockers, hardware, equipment, supplies, etc. Edward Merchant is secretary and business manager.

Schneider-Bowman Co., Van Dyke Street, Philadelphia, plans rebuilding part of foundry and pattern shop destroyed by fire Dec. 11 with loss over \$70,000 with equipment.

General Refractories Co., 106 South Sixteenth Street, Philadelphia, is arranging for increase in capital from 225,000 to 300,000 shares of stock, no par value, for expansion.

M. A. Regan, 5903 Cobbs Creek Parkway, Philadelphia, and associates have organized Philadelphia Metal Works, and plan early operation of local plant to manufacture machine equipment and metal products. Rudolph Weber, 4445 North Third Street, is also interested in company.

Frederick H. Levey Co., 222 Forty-fourth Street, Brooklyn, manufacturer of inks, etc., has acquired six-story factory, 95 x 216 ft., at Washington Avenue and Thirteenth Street, Philadelphia, heretofore held by General Electric Co., and will remodel for new plant.

Crescent Insulated Wire & Cable Co., Olden and Taylor Avenues, Trenton, N. J., has awarded general contract to Karno-Smith Construction Co., Broad Street Bank Building, for two-story addition, 110 x 115 ft., to cost about \$85,000 with equipment. J. Osborne Hunt, Hunt Building, is architect.

Central Airport, Inc., Philadelphia, care of Black & Bigelow, Inc., 551 Fifth Avenue, New York, consulting engineer, has plans for airport at Camden, N. J., consisting of hangars, repair and reconditioning shops, oil storage and other buildings, to cost about \$1,750,000.

Phoenix Horse Shoe Co., Joliet, Ill., is concluding negotiations for purchase of plant and business of Bryden-Neverslip Co., Catasauqua, Pa., manufacturer of horse shoes, pliers, etc., with branch plants at New Brunswick, N. J., and Montreal, effective Jan. 1. Purchasing company plans expansion in eastern district.

Standard Tractor Co., Harrisburg, Pa., care of Harrisburg Commercial and Industrial League, Charles K. Stevenson, president, now being organized by local interests, headed by O. E. Williams, is arranging for purchase of property for new plant to manufacture farm tractors and kindred agricultural equipment, including parts and assembling department.

ments, initial units to cost more than \$85,000 with machinery.

American Steel & Wire Co., South High Street, Allentown, Pa., has awarded general contract to American Bridge Co., 30 Church Street, New York, for one-story addition to local plant, to cost over \$50,000 with equipment. Headquarters are at 208 South LaSalle Street, Chicago.

City Council, Coatesville, Pa., is planning municipal airport, including hangar, repair shop and other units, to cost more than \$65,000. Frank Breuninger, member of council, is chairman of committee in charge.

Cincinnati

CINCINNATI, Dec. 17.—While machine tool buying has shown a further recession the past week and few purchases of importance are expected until after the first of the year, business this month is considered good compared with December in recent years. It is likely, however, that bookings will be substantially less than the monthly average for the previous six months. Machine tool manufacturers are confident that the first quarter of 1929 will be an active period. Prospects in the automobile industry are promising for the purchase of considerable equipment, and business from the general industrial field probably will remain at or near its present high level. Most executives are of the opinion that buying by railroads next year will not much exceed the rather meager volume of the past 12 months.

That foreign trade may be expanded somewhat in 1929 is the belief of some local machine tool companies. A few manufacturers building single-purpose tools for the automobile and other highly specialized industries have secured a liberal amount of business from European countries this year. One company is reported to have bookings totaling more than \$250,000 from France alone, as well as good-sized orders from England, Germany and Italy. In the past week a Cincinnati builder secured a substantial percentage of its business from European countries.

Southern Railway has bought the tools on its recent list, but Norfolk & Western still has a few items to purchase. Local plants continue to operate on heavy production schedules, although this activity is not equally distributed among the various machine tool companies.

Bids will soon be asked by Jaeger Machine Co., 518-20 Dublin Road, Columbus, Ohio, for one and two-story addition, to cost about \$50,000 with equipment. Bassett & Tresselt, 217 East Broad Street, are architects.

Leland Electric Co., 222 North St. Clair Street, Dayton, Ohio, manufacturer of fractional horsepower motors, parts, etc., has awarded general contract to C. H. Shook, Inc., Dayton, for one-story addition, 165 x 485 ft., and boiler plant, to cost about \$225,000 with equipment. Balinger Co., Twelfth and Chestnut Streets, Philadelphia, is architect and engineer.

Avey Drilling Machine Co., 25 East Third Street, Cincinnati, has awarded general contract to B. T. Wisenall, Covington, Ky., for one-story addition to Covington plant, to cost about \$28,000 with equipment.

Samuel Stamping & Enameling Co., Chattanooga, Tenn., is planning expansion program at North Chattanooga, to cost about \$100,000 with equipment. It is

proposed to more than double present capacity.

Murray Corporation of America, Inc., Detroit, has purchased tract of 45 acres at Memphis, Tenn., for new plant to manufacture automobile bodies, consisting of main one-story unit, 575 x 640 ft., and auxiliary buildings, to cost over \$1,500,000 with equipment. Albert Kahn, Inc., Marquette Building, Detroit, is architect and engineer.

Hardwick Stove Co., Cleveland, Tenn., has approved plans for construction of four-story unit, to cost about \$100,000 with equipment.

Gem Metal Shield Co., 199 Bacon Street, Dayton, Ohio, plans new one-story factory totaling about 25,000 sq. ft. floor space, to cost over \$60,000 with equipment.

Plant and business of W. J. Savage Co., 912 West Clinch Avenue, Knoxville, Tenn., manufacturer of equipment for coal mines, quarries, etc., have been acquired by new interests, headed by W. M. Fulton, 320 Temple Avenue. New owners plan expansion, including other branches of machinery manufacture.

LeBlond Aircraft Engine Corporation, Cincinnati, has announced that LeBlond engine has passed United States Navy 50-hour endurance test and company has been granted United States Department of Commerce type certificate No. 12. Production soon will be increased to four engines a day.

Cleveland

CLEVELAND, Dec. 17.—Machine tool sales held up well through the first half of December, which is usually a quiet month in the machinery trade. Considerable slowing down is expected during the remainder of the month. There was a fair volume of scattered business the past week, which was well distributed, a moderate portion coming from industries outside of the automotive field. A local manufacturer of turret lathes, whose sales were exceptionally good in November, reports that its business so far this month has exceeded the previous month.

Glenn L. Martin Co., Cleveland, during the week purchased six machines aggregating about \$35,000 for partly equipping a new plant. Company will erect a plant in the East to manufacture airplanes for Navy Department, but pending selection of a permanent site it will equip a plant for experimental work at Baltimore, Curtiss Aeroplane & Motor Co., Buffalo, has placed an order with Kearney & Trecker Co. for 12 new type Milwaukee millers, several other milling machines and special fixtures aggregating \$82,000.

Kelley Reamer Co., 3705 West Seventy-third Street, Cleveland, has awarded general contract to Julius Linder, 15615 West Delaware Avenue, Lakewood, for one-story addition to cost \$35,000 with equipment. Edward W. Putnam is president.

Gluntz Brass Foundry Co., 3301-5 East Fifty-fifth Street, Cleveland, has plans for one-story plant to cost \$70,000 with equipment.

American Steel & Wire Co., Rockefeller Building, Cleveland, has plans for new one-story rod mill at Cuyahoga Works, to cost more than \$150,000 with equipment.

Jordan Motor Co., 1070 East 152nd Street, Cleveland, has awarded general contract to Hunkin-Conkey Construction Co., Hunkin-Conkey Building, for one-

story addition, 45 x 100 ft., to cost about \$45,000 with equipment.

Dart Boats, Inc., 2215 Collingwood Avenue, Toledo, Ohio, W. C. Hayes, president, has awarded general contract to Combs-Nauman Co., 912 Summit Street, for one-story boat-building and repair plant, 65 x 300 ft., to cost about \$75,000 with equipment.

McKinley Aeroways, Inc., Canton, Ohio, recently organized, has acquired McKinley airport on Louisville Road and plans development of air terminal, including construction of hangars, repair and reconditioning shops, and other mechanical units, to cost more than \$60,000.

Sandusky Cement Co., Sandusky, Ohio, has authorized change of name to Medusa Portland Cement Co., and will increase capital from 75,000 to 225,000 shares of stock, no par value, part of proceeds to be used for expansion. Mills are operated at Bay Ridge, near Sandusky; Silica, Ohio; York, Pa., and Dixon, Ill.

Youngstown Sheet & Tube Co., Stambaugh Building, Youngstown, Ohio, is having plans completed by Allen & Garcia Co., 332 South Michigan Avenue, Chicago, consulting engineer, for new coal mining and washing plant in western Pennsylvania, to cost over \$850,000 including machinery.

Detroit

DETROIT, Dec. 17.—Contract has been let by Ajax Bolt & Nut Co., 5623 Gratiot Avenue, Detroit, to Alois LaPeirre, Grosse Pointe Park, Mich., for rebuilding part of two-story plant recently destroyed by fire, to cost close to \$50,000 with equipment.

Michigan Smelting & Refining Co., 7885 Joseph Campau Avenue, Detroit, has awarded general contract to Kreighoff Construction Co., Detroit, for an addition to cost over \$70,000 with equipment. Christian W. Brandt, Kresge Building, is architect.

Zenith-Detroit Corporation, Hart Avenue, Detroit, manufacturer of carburetors, etc., has awarded general contract to F. N. Cooper, 6370 Gratiot Avenue, for two-story and basement addition, 62 x 120 ft., to cost about \$60,000 with equipment.

Grasselli Chemical Co., 629 Euclid Avenue, Cleveland, subsidiary of E. I. duPont de Nemours & Co., Wilmington, Del., has acquired 20 acres at Ecorse, Mich., for new plant to manufacture sulphuric acid, initial unit to cost about \$1,000,000 with machinery, and ultimate plant about five times that sum.

Timken-Detroit Axle Co., Clark Street, Detroit, has awarded general contract to C. O. Barton Co., 1900 East Jefferson Avenue, for two-story addition, to cost about \$55,000 with equipment.

Wilcox-Rich Corporation, Detroit, manufacturer of valves, piston rings, etc., for automobile engines, is completing arrangements for purchase of plant and business of Rich Tool Co., 1501 East Ferry Street, manufacturer of kindred equipment, and will merge with its organization. Consolidated company will operate plants at Marshall, Saginaw and Battle Creek, Mich., and plans expansion.

Board of Education, Coloma, Mich., contemplates installation of manual training equipment in new two-story grade and high school to cost about \$120,000, for which bids will soon be asked on general contract. Warren, Holmes & Powers Co., 820 Michigan Avenue, Chicago, are architects.

Star Tool & Die Works, 2520 Twenty-fourth Street, Detroit, is arranging gen-

eral expansion program, including installation of machine tools and other equipment.

National Moulding Co., 675 Richmond Avenue, Northwest, Grand Rapids, Mich., has been organized to manufacture special steel and brass shapes, such as automobile garnish moldings, window channels, etc. Equipment has been purchased and plant is expected to be in operation this month.

Columbia Tool Steel Co., has moved its Detroit office from 144 East Woodbridge Street to 1718 Howard Street.

Chicago

CHICAGO, Dec. 17.—Sales in the first half of December equalled the average of the two preceding months, a situation unparalleled in previous years with the possible exception of the war period. Fresh inquiry remains at a high level, but indications are that in the next two weeks considerable business will be held for placement after Jan. 1.

The Missouri Pacific and the Cotton Belt each have ordered several machine tools at St. Louis. At Chicago a demand for presses is noted, and at Harvey, Ill., the Buda Co. is closing its list. Purchases against the Fort Wayne list of the International Harvester Co. have been delayed, but orders will probably be placed soon after the first of the year. The Nash Motors Co., Racine, Wis., and the Marmon Motor Car Co., Indianapolis, are said to be planning extensions.

Illinois Power & Light Co., 231 South LaSalle Street, Chicago, is planning construction of a gas plant at Decatur, Ill., to cost \$300,000. T. J. Lucas is engineer.

General Engineering Works, 340 West Huron Street, Chicago, manufacturer of screw machine products, has plans for one-story plant to cost about \$55,000 with equipment. Weiss & Niestedt, 53 West Jackson Boulevard, are architects.

Baker Stove Co., 818 Church Street, Belleville, Ill., is having plans drawn for new three-story plant, 115 x 120 ft., to cost about \$60,000 with equipment. Gill & Jackson, 1328 Walnut Street, Murphysboro, Ill., are architects.

Studebaker Sales Co., 45 West Twenty-fourth Street, Chicago, has asked bids on general contract for new multi-story service, repair and sales building, to cost \$350,000 with equipment. Loewenberg & Loewenberg, 150 West Monroe Street, are architects.

Andrews Wire & Iron Works, 1802 Preston Avenue, Rockford, Ill., has work under way on one-story addition, 100 x 125 ft., to cost over \$50,000 with equipment.

Great Northern Railway Co., St. Paul, Minn., will soon begin construction of addition to engine house and repair shops at Whitefish, Mont., to cost \$70,000 with equipment. J. R. W. Davis, St. Paul, is chief engineer.

Independent Pneumatic Tool Co., 600 West Jackson Boulevard, Chicago, has plans for an addition to plant at Aurora, Ill., to cost over \$40,000 with equipment.

Board of Education, Blue Island, Ill., is said to be planning installation of manual training equipment in new two-story addition to high school to cost \$350,000, for which plans have been drawn by Perkins, Chatten & Hammond, 160 North LaSalle Street, Chicago, architects.

Des Moines Steel Tank Co., Des Moines, Iowa, will soon erect two buildings to manufacture steel tanks, small

buildings, baskets and other livestock equipment. Company recently acquired factory at East Des Moines for tank production. New units, which will cost \$60,000, will double present capacity. John M. Albrecht is owner.

Herman Nelson Corporation, Eighteenth Street and Third Avenue, Moline, Ill., manufacturer of heating and ventilating devices and equipment, will soon begin work on two-story addition to factory and extension to office building to cost about \$60,000.

Dreis & Krump Mfg. Co., 7416 Loomis Boulevard, Chicago, maker of sheet metal machinery, has purchased Kutscheld Mfg. Co., Chicago, maker of power shears, and will extend manufacturing of latter company.

Milwaukee

MILWAUKEE, Dec. 17.—The first half of the month produced a substantial volume of new business for machine-tool builders in this locality, although sales were hardly as numerous as in previous weeks. Inquiry, however, gives promise of a good demand after the turn of the year, the present slackening being more or less seasonal, but less pronounced than in former years. Machine tool executives regard the future as bright, and look for a new year probably as active as 1928.

Plans for expenditure of approximately \$1,000,000 for erection and equipment of a new steel stamping unit have been made public by Charles W. Nash, president Nash Motors Co., Kenosha, Wis. This is in addition to a \$3,000,000 enlargement program now under way at Kenosha, Racine, Milwaukee and Pine Bluff, Ark., factories. Location of the steel products plant is contingent upon the closing of Phillips Avenue, Racine, by action of Common Council. David M. Averill is general manager Racine division.

General Refrigeration Co., 108 East Shirland Avenue, Beloit, Wis., manufacturer of railroad and commercial refrigerating systems, contemplates extension early in 1929, for which plans are now being prepared. T. E. Swords, Rockford, Ill., is president, and J. J. Tyndal, Beloit, secretary.

Modine Mfg. Co., Racine, Wis., manufacturer of radiators and cooling systems for internal combustion engines, automotive, industrial, etc., expects to start work after Jan. 1 on an extension to its plant to cost \$100,000.

Fish Rotary Oven Co., Walworth, Wis., manufacturer of bakery equipment and machinery, will move its plant and headquarters to Beloit, Wis. A site at Henry Avenue and Chicago, Milwaukee, St. Paul & Pacific Railway in Beloit has been purchased, and construction will start about March 1.

F. M. Harbach, secretary and business manager Milwaukee Board of School Directors, 1002 McKinley Avenue, Milwaukee, closes bids Jan. 3 on a \$400,000 addition to Boys' Trade and Technical High School, at Virginia, Greenbush and Hanover Streets. G. E. Wiley is school board architect.

Rockton Electric Co., Rockton, Ill., subsidiary of Wisconsin Power & Light Co., 16 North Carroll Street, Madison, Wis., will place contracts late this month for a \$150,000 hydroelectric generating unit, 32 x 65 ft., designed by Mead & Seastone, consulting engineers, Madison. Equip-

ment orders will be placed shortly. E. J. Kallevang is chief engineer.

Western Metal Specialty Co., Milwaukee, manufacturer of sheet metal parts for automotive and industrial trade, has placed contracts for addition and new office. This is third addition made within year, which will increase manufacturing facilities 25 per cent.

South Atlantic

BALTIMORE, Dec. 17.—Contract has been let by Chemical & Pigments Co., St. Helena, Baltimore, to Price Construction Co., Maryland Trust Building, for new units, including storage and distributing building and power plant, to cost about \$85,000 with equipment.

Ovens, power equipment, conveying and other machinery will be installed in three-story plant to be constructed at Washington by General Baking Co., 420 Lexington Avenue, New York, for which bids will be received on general contract until Dec. 27. C. B. Comstock, 110 West Fortieth Street, New York, is architect and engineer.

City Council, Charleston, S. C., is planning municipal airport, to include hangars, repair and reconditioning shops and other units, to cost over \$50,000. Tract of 800 acres at Ten Mile Station has been secured. Caspar S. Chisholm, 50 Broad Street, is chairman of committee in charge.

Virginia Barrel Co., Winchester, Va., has acquired property at Mariners Harbor, Staten Island, N. Y., formerly held by Downey Shipbuilding Corporation, and plans construction of new plant for Eastern trade, to cost more than \$65,000 with equipment.

Georgia Power & Light Co., Valdosta, Ga., is planning extensions in power plant to cost about \$80,000 with equipment. One-story unit will be built, 100 x 200 ft., and present station removed to building, with installation of additional machinery.

Albemarle-Chesapeake Corporation, Inc., West Point, Va., has awarded general contract to John T. Wilson Co., Inc., Richmond, Va., for new mill to manufacture kraft papers, to cost more than \$1,000,000 with machinery. Ellis Olsson, vice-president, is engineer in charge.

Public Improvement Commission, Municipal Office Building, Baltimore, will soon take bids on general contract for two-story polytechnic institute, to cost about \$1,000,000 with equipment, including manual training facilities. C. H. Anderson, 9 East Pleasant Street, is architect. Henry Adams, Calvert Building, is consulting engineer.

Asiatic Petroleum Co., Ltd., 65 Broadway, New York, will begin work on new storage and distributing plant at Wagners Point, Baltimore, with facilities for handling about 130,000 gal., to include boiler house, machine shop and other units, to cost more than \$150,000 with equipment.

Provision Co., Columbus, Ga., T. G. Strange, head, has plans for new meat-packing plant, with mechanical handling facilities, including conveying equipment. Refrigerating plant will be installed. Project will cost more than \$75,000 with equipment. Henschlen & McLaren, 1637 Prairie Avenue, Chicago, are architects.

Locke Insulator Corporation, Charles and Cromwell Streets, Baltimore, manufacturer of high-tension electrical insulators, has engaged W. S. Austin, Maryland Trust Building, architect and

engineer, to prepare plans for additional units, including testing building, and storage and distributing extension, to cost \$55,000.

Gulf States

BIRMINGHAM, Dec. 17.—Goodyear Tire & Rubber Co., Akron, Ohio, has acquired tract of 275 acres at Gadsden, Ala., for new mill. Initial unit will comprise several buildings, and is estimated to cost more than \$1,500,000 with machinery. Four such units are projected, with entire cost of \$6,000,000. Company is also considering new fabric mill at same location.

Richard T. Wilson, 218 Sixth Avenue, North, Nashville, Tenn., and associates have acquired property at Birmingham for new plant to manufacture railroad equipment, including rail joints, etc., initial unit to cost about \$100,000 with machinery.

Houston Natural Gas Co., Houston, Tex., is disposing of bond issue of \$2,000,000, not less than \$500,000 to be used for extensions and improvements in properties, including pipe line construction.

Rushton Corporation, 2124 South Fourth Avenue, Birmingham, has approved plans for one-story ice-manufacturing plant in Mount Brook Village district, to cost about \$50,000 with equipment.

Tampa Shipbuilding & Engineering Co., Tampa, Fla., has plans for floating dry-dock to handle large vessels, including shops and equipment for construction and repair work. Project is reported to cost more than \$1,000,000.

Texarkana & Fort Smith Railway Co., Texarkana, Tex., with headquarters at Kansas City, Mo., is planning new engine terminal and repair shops at Dowling, Tex., including engine house, machine shops, compressor building, power house and other structures, to cost more than \$150,000 with equipment.

El Paso Natural Gas Co., El Paso, Tex., care of White, Weld & Co., 14 Wall Street, New York, recently formed, is planning construction of 16-in. pipe line from Lea County, N. M., oilfields to El Paso and vicinity, about 200 miles for natural gas supply, to cost about \$3,000,000. Company is arranging for sale of bond issue of \$3,500,000.

City Council, Montgomery, Ala., has acquired 800 acres for municipal airport, to include hangars, repair and reconditioning shops, oil storage and other buildings. An aeronautical school on portion of site is under consideration. Project is reported to cost more than \$90,000.

Pullman Car & Mfg. Corporation, 79 East Adams Street, Chicago, has purchased car building works of Tennessee Coal, Iron & Railroad Co., Birmingham, and plans enlargement.

Planters' Cotton Oil Co., El Paso, Tex., care of George E. Moore, 3419 Madison Avenue, recently formed by Mr. Moore and associates, with capital of \$300,000, is said to be planning early operation of local mill.

Dubus & Atwood Co., Crowley, La., has been organized to take over and operate local plant of Acadia Iron Works. Plans are under way for expansion. Wilton Dubus and Frank Atwood head new company.

A. C. Burton & Co., 1402 Main Street, Houston, Tex., local representatives for Chrysler automobile, have purchased property at Milan and Bell Streets and

plan four-story service, repair and garage building, to cost about \$225,000 with equipment. Joseph Finger, Keystone Building, is architect.

J. E. Morgan, San Juan, Tex., and associates plan construction of new cold storage and refrigerating plant at Donna, Tex., to cost over \$70,000 with equipment.

Buffalo

BUFFALO, Dec. 17.—Exolon Co., Commercial Avenue, Blasdell, N. Y., manufacturer of abrasives, has acquired adjoining tract of nine acres and plans addition, to cost more than \$75,000 with equipment, work to begin early next year.

National Carbon Co., 3625 Highland Avenue, Niagara Falls, N. Y., manufacturer of storage batteries, etc., has awarded general contract to Wright & Kremers, Inc., Main Avenue and Pine Street, for one-story addition, to cost about \$50,000 with equipment.

Curtiss Aeroplane & Motor Co., 74 Kail Street, Buffalo, has acquired properties and assets of Reid Aircraft Co., Ltd., Montreal, and will operate in future as a Canadian subsidiary, with name of Curtiss-Reid Aircraft Co., Ltd., capitalized at 350,000 shares of stock, no par value. It is also planned to increase output of Montreal factory and use for distributing center for Curtiss airplanes. J. A. B. Smith is treasurer of new company.

Binghamton Light, Heat & Power Co., Binghamton, N. Y., has arranged for bond issue of \$1,000,000, part of proceeds to be used for expansion, including transmission lines. Company is operated by General Gas & Electric Co., 50 Pine Street, New York.

G. L. F. Exchange, Phelps, N. Y., H. E. Babcock, general manager, operating local fertilizer manufacturing plant, has acquired former plant of Universal Gypsum & Lime Co., at Batavia, N. Y., and will remodel for mechanical-mixer plant. Portion of structure will be given over for storage and distribution, with mechanical handling equipment.

William Schall & Co., 160 Broadway, New York, bankers, have purchased plant and business of Brown-Lipe Gear Co., Syracuse, N. Y., manufacturer of automobile gears and transmissions, for about \$3,400,000. Company will be reorganized and expanded.

Department of Public Works, Municipal Building, Buffalo, George F. Fisk, commissioner, will receive bids until Jan. 3 for metal furniture and equipment for new city court building, as per specifications on file.

St. Louis

ST. LOUIS, Dec. 17.—General Aero Co., Wichita, Kan., has been organized to take over and operate Swallow Airplane Co. and Cessna Aircraft Co., both with local plants. Expansion is being arranged. General company will also acquire a company which manufactures airplane propellers, and an aircraft motor manufacturing company, names to be announced later.

St. Louis Public Service Co., 3369 Park Avenue, St. Louis, has filed plans for two-story addition to equipment and mechanical shop at 577 DeBaliviere Avenue, 27 x 100 ft., to cost about \$40,000 with tools, etc.

Wagner Electric Corporation, 6400 Plymouth Street, St. Louis, manufacturer of motors, will soon take bids on general

contract for five-story unit, 80 x 120 ft., and one-story extension, 120 x 375 ft., to cost over \$500,000 with equipment. Three crane runways will be installed for 30, 5 and 2-ton capacity travelling cranes. Condon & Post, 53 West Jackson Boulevard, Chicago, are architects.

Little Rock Refining Co., 505 A. O. U. W. Building, Little Rock, Ark., has plans for new oil refinery near city, with capacity of about 1000 bbl. crude oil per day. Initial unit will cost about \$100,000. William Bruck is company construction engineer, address noted.

Charles M. Dunning Construction Co., 420 North Hudson Street, Oklahoma City, Okla., has secured award for eight-story and basement automobile service, repair and garage building, 76 x 150 ft., for local interests, to cost \$265,000 with equipment.

Knoll Aircraft Corporation, 471 West First Street, Wichita, Kan., T. N. Thomas, president, is said to be planning new airplane manufacturing plant near municipal airport, to cost about \$85,000 with equipment.

Titanium Pigment Co., 1 Sidney Street, St. Louis, has awarded general contract to Fruin-Colnon Construction Co., Merchants Laclede Building, for power plant at factory, to cost \$40,000 with equipment.

City Council, Muskogee, Okla., is arranging for extensions and improvements at municipal airport, known as Hathbox Flying Field, for which bonds in amount of \$195,000 have been approved, including hangars, repair shop and other buildings.

J. I. Case Threshing Machine Co., Racine, Wis., has awarded general contract to John Mehuron, 1045 South Twenty-sixth Street, Lincoln, Neb., for one-story factory branch and distributing plant at Lincoln, 75 x 90 ft., to cost about \$25,000 with equipment.

Camden Furniture Co., Camden, Ark., is arranging an expansion program, to cost over \$85,000 with equipment.

Indiana

INDIANAPOLIS, Dec. 17.—Board of Education, Gary, plans installation of manual training equipment in new high school to cost about \$900,000. William B. Ittner, 911 Locust Street, St. Louis, is architect.

Globe-Bosse-World Furniture Co., Evansville, is planning to rebuild part of plant destroyed by fire Dec. 11, with loss reported over \$250,000 including machinery.

Ross Caldwell, 239 Cumberland Street, Anderson, architect, is completing plans for two-story automobile service, repair and garage building, to cost about \$100,000 with equipment.

S. F. Bowser & Co., Fort Wayne, manufacturers of gasoline pumps, etc., are carrying out an expansion program, including establishment of new chromium plating department to cost \$50,000, for development of new line of production.

Board of Trustees, Purdue University, West Lafayette, is having plans drawn for new engineering building, to cost about \$150,000 with equipment. Walter Scholer, Painters' and Decorators' Building, Lafayette, is architect.

John Deere Plow Co., 216 South Senate Avenue, Indianapolis, has awarded general contract to Indiana Engineering & Construction Co., Central Building, Fort Wayne, for four-story storage and distributing plant, 100 x 100 ft., at Fort

Wayne, to cost about \$125,000 with equipment. Headquarters are at Moline, Ill.; O. A. Eckerman is company architect at last-noted address.

Municipal Electric Light & Power Works, Fort Wayne, is having plans prepared for a power house to cost \$300,000. Froelich & Emery, Toledo, Ohio, are engineers.

Groble Gas Regulator Co., Anderson, is building an addition, 40 x 100 ft.

Pacific Coast

SAN FRANCISCO, Dec. 12.—Los Angeles Can Co., Los Angeles, subsidiary of Continental Can Co., 1 Pershing Square, New York, has awarded general contract to Scofield-Twaits Co., Pacific Finance Building, for one and two-story plant, main unit, 300 x 500 ft., to cost about \$1,000,000 with machinery. Francisco & Jacobus, Pershing Square Building, New York, are architects and engineers.

Anaheim Co-Operative Orange Growers' Association, Anaheim, Cal., is planning new three-story pre-cooling plant and packing house addition, to cost about \$85,000 with equipment.

Southern Sierras Power Co., Riverside, Cal., is having plans drawn for new equipment storage, distributing and repair plant, consisting of six one-story units, with main shop, 100 x 140 ft., including outside crane runway, 40 x 140 ft., to cost over \$100,000 with equipment. C. A. Kelly is purchasing agent, in charge.

California Art Tile Co., Main and Twenty-seventh Streets, Richmond, Cal., is planning an expansion and improvement program, to cost about \$400,000 with equipment.

Ballard Drop Forge Co., 1145 West Forty-sixth Street, Seattle, has begun construction of one-story unit, 56 x 120 ft., to replace building recently destroyed by fire.

Inland Power & Light Co., Portland, Ore., is planning hydroelectric power development on Lewis River, in Clarke, Cowlitz and Skamania Counties, Wash., with total capacity of 233,000 hp., to cost more than \$5,000,000 with transmission system.

Pacific Coast Borax Co., Wilmington, Los Angeles, has asked bids on general contract for one-story storage and distributing plant, 50 x 800 ft., to cost about \$100,000 with equipment. A. C. Martin, Higgins Building, is architect.

Union Ice Co., San Francisco, has plans for new plant at Torrance, Cal., to cost over \$75,000 with equipment.

Northwestern Pacific Railroad Co., 64 Pine Street, San Francisco, has approved plans for one-story equipment repair shop at Tiburon, Cal., to cost about \$35,000 with machinery. Engineering department, address noted, is in charge.

Northwestern Electric Co., Portland, is planning enlargements in steam-operated electric power plant, to cost over \$1,000,000 including extensions in transmission lines.

General Petroleum Corporation, Higgins Building, Los Angeles, has authorized construction of pipe line from properties in Kettleman Hills field to Lost Hills and vicinity, about 35 miles, to cost about \$300,000. W. B. Pyles is company superintendent, in charge.

Empire Development Co., care of H. L. Haehl, Humboldt Bank Building, San

Francisco, is planning hydroelectric power development on Kern River, Tulare County, to cost more than \$20,000,000 with transmission system.

Canada

TORONTO, Dec. 17.—While builders and dealers report a large prospective demand for machine tools, sales the past week were below the average of former weeks. The curtailed buying, however, is due to the approaching holiday season. A number of buyers are considering lists for replacement and new works, but most of this business will be carried over into the new year. The chairman of the committee on public utilities, Winnipeg, is buying machinery, tools, supplies and equipment for the Slave Falls power development.

Modern Table Co., 934 St. Catherine Street, Montreal, is having plans prepared by Gravel & Laliberte, 180 Ontario Street East, for a three-story factory, 20 x 72 ft., to cost \$35,000.

Matthews Conveyor Co., Port Hope, Ont., is arranging for an addition to cost \$20,000.

Canada Cement Co., Phillips Square, Montreal, contemplates spending \$1,000,000 on a plant at Quebec.

W. S. Tyler, 3615 Superior Avenue, N. E., Cleveland, Ohio, has purchased a site on Ontario Street, St. Catharines, Ont., for erection of a factory to manufacture woven wire screens, screening equipment, ornamental iron, bronze, etc.

Toronto Iron Works, Ltd., foot of Cherry Street, Toronto, is having plans prepared by D. Brouse, 514 King Street East, for a plant to cost \$500,000.

Curtiss-Reid Aircraft Co., 347 Craig Street West, Montreal, is contemplating erection of an airplane manufacturing plant at St. Laurent, Que.

Western Canada

Bids will be received by chairman of Committee on Public Utilities, Winnipeg, until Dec. 31, for manufacture, delivery and erection at Slave Falls, Man., of one 100-ton main lift and 20-ton auxiliary lift electric traveling crane complete.

Ingmika Mines, Ltd., Prince George, B. C., is having plans prepared by its own engineers for a hydroelectric power plant at Black Canyon, Finlay Forks, on Omineca River.

Manitoba Rolling Mills Co., Ltd., 875 Logan Avenue, Winnipeg, is having plans prepared by its own staff for a plant at East Calgary, Alta., to cost \$400,000.

Dominion Bridge Co., head office, Montreal, has acquired control of Riverside Iron Works, Calgary, Alta. Dominion company expects to spend \$300,000 on Calgary plant next spring.

Foreign

BIDS are being asked by Ministry of Public Works, Bogota, Colombia, to be received between Jan. 4 and 17, for machine tools and a locomotive turntable.

Municipal Government, Toyko, Japan, is arranging for city improvements to cost 108,512,000 yen (about \$54,256,000), including construction at Tokyo Bay harbor, with docks, wharves, mechanical conveying and handling equipment, etc., to cost 27,900,000 yen (about \$13,950,000); extending and modernizing slaughter houses, with installation of equipment, to cost 1,500,000 yen (\$750,000); sewage

construction and improvements, including pumping and other machinery, to cost 33,300,000 yen (\$16,650,000) over 10-year period; and new commercial school at Kyobashi within 36 months, to cost 812,000 yen (\$406,000).

Government Railways of New Zealand, Wellington, will receive bids until Feb. 18 for machine tools, autogenous welding equipment, and a freight elevator.

Ford Motor Co., Ltd., London, England, recently organized to manufacture and distribute Ford automobiles in that country, is disposing of stock issue to total about \$14,000,000, part of fund to be used for new plant on 300-acre tract at Dagenham, England, to have initial output of 200,000 cars per annum; expansion in Manchester plant, to be used in future for assembling of new cars and manufacture of replacement parts for former models, and development of tractor plant at Cork, Ireland, for annual output of 30,000 tractor units. Henry Ford, Detroit, will be an official of new company; Hon. Roland D. Kitson, 3 Victoria Street, London, director of Bank of England, is also prominent in new organization.

Representing Government Railways of Colombia, Baldwin Locomotive Works, 500 North Bridge Street, Philadelphia, N. W. Semple, Jr., in charge, is said to be arranging for early purchase of machine tools and other equipment for locomotive repair and reconditioning shops at Cali, to cost more than \$1,500,000.

Officials of Union Oil Co. of California, Union Oil Building, Los Angeles, have organized a subsidiary, Compania Mexicana de Petroleo Union, S. A., to take over and operate oil properties in Miahaupon district, Mexico, to include installation of drilling and other machinery, pipe lines, loading facilities and other equipment.

La Union Metalurgica, Sociedad Anonima, Castillejos, 111, Barcelona, Spain, wishes to get in touch with makers of machines for threading augers such as are used by coopers, the augers being of the type which have a gimlet point.

A company at Warsaw, Poland, is completing plans for new soap manufacturing plant, to cost about \$2,500,000 with machinery, to be completed next summer. Information at office of Bureau of Foreign and Domestic Commerce, Washington, reference Great Britain No. 76089.

New Trade Publications

Tractors.—Atlas Engineering Co., Clintonville, Wis. Folder of six pages, illustrating and describing a tractor with driving and steering on all four wheels. Heavy lugs on the wheels are used on soft ground, whereas rubber shoes can be fitted for city work.

Cranes and Trolleys.—H. D. Conkey & Co., Mendota, Ill., Catalog No. 110. Contains 50 pages of illustrations and text describing types of trolleys and wall bracket and mast type jib cranes, push cranes, underhung and standard hand power and electric cranes and hoists. Specifications of standard equipment and the list prices subject to discount are given in each section. The booklet is printed in color and presents an attractive appearance.

Small Motors.—General Electric Co., Schenectady, N. Y. Bulletins GEA-71B and 81B illustrate and describe respectively wound-rotor induction motors of ¾ to 10 hp. and double squirrel-cage motors of 3 to 15 hp. Both are for three-phase or two-phase circuits and may be had for 220, 440 or 550 volts.